JPRS 74097

28 August 1979

USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 44

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50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. JPRS 74097	2.	3. Recipient's Accession No

4. Title and Subtitle
USSR REPORT: CYBERNETICS, COMPUTERS, AND AUTOMATION TECHNOLOGY, No. 44

5. Report Date
28 August 1979

6.

7. Author(s)

8. Performing Organization Rept. No

9. Performing Organization Name and Address
Joint Publications Research Service
1000 North Glebe Road
Arlington, Virginia 22201

10. Project/Task/Work Unit No

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
As above

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The report contains articles, abstracts and news items on theory, design, development and application of analog and digital apparatus, elements and components of control systems, reliability and optimality, information theory, and the theory of automata.

17. Document Analysis a. Descriptors

USSR
Automation
Automata Theory
Information Theory
Computers
Computer Programming

b. Identifiers/Open Ended Terms

c. COSATI Field/Group 6D, 9B, 9D

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22161	UNCLASSIFIED	121
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 74097

28 August 1979

USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 44

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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AUTOMATED MANAGEMENT SYSTEMS: SUMMARIES AND PROBLEMS

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian
No 3, 79 pp 72-78

[Article by F. I. Solodovnikov, candidate of economic sciences, director of the State Scientific-Research Institute of Automated Systems of Planning and Management of the USSR Ministry of Instrument Making, Automation Equipment and Management Systems (Novosibirsk)]

[Text]

ASU: Ways to Raise Efficiency

Developing and introducing automated management systems (ASU) on the basis of using computers and economic-mathematical methods are one of the basic directions for raising the efficiency of production control. Therefore, a huge amount of money is allotted on creating ASU in our country. Although the norm coefficient for efficiency of investment for creating ASU is set at more than twice as much as for other investments in new equipment (0.33 as against 0.15), ASU possibilities are far from being utilized fully. An ASU analysis of 41 machine building enterprises (they were released for industrial operation in 1971-1975) shows that while a fourth of the systems operated with an efficiency coefficient of 0.5 and greater, over a third had a yield smaller than normal.*

*Problems of increasing the efficiency of management systems by sectors, enterprises and associations in industry (conference materials). Raising the quality and efficiency of management systems. Novosibirsk, 1977, p 35.

The actual effect of introducing ASU does not often reach rated values. For example, according to the data of the Ninth Five-Year Plan, the actual saving compared to that planned when developing the ASU was 25 percent at the Donetsk Machine Building Plant imeni Lenin's Komsomol of the Ukraine; 20 percent at the Kramatorsk Heavy Ma ine Tool Building Plant imeni V. Ya. Chubar'; 18 percent at the Novokramat . Machine Building Plant imeni V. I. Lenin; 14 percent at the Zhdanovsk Hea chine Building Plant imeni 50 years of the Great October Socialist Revolut .* Other facts can be cited about the ASU in recent years in industrial sectors still not being an important means for solving problems posed by the 25th party congress on raising the efficiency of social production.

Why is this? And how can the ASU efficiency be raised in industry?

Main Reason--Imperfection of the Economic Mechanism

Frequently individual managers are successful in obtaining expensive computers and creating ASU not on the basis of economic calculations but for prestige considerations so as not to be blamed for conservatism and technical lag. In fact, the economic condition of the customer enterprises as well as of developing organizations depends little on the efficiency of their ASU.

As is well known, the basic criteria for evaluating the activity of ministries, associations and enterprises are the volume of products sold, the commodity gross output per worker and the volume of profit. The volume commodity of products sold and the gross output may be increased artificially by increasing the ratio of material-consuming products. The profit volume can be increased in the same way since, in present practice, profit pricing norms for concrete products in a given industrial sector are taken in percentages of their production costs. The existing economic management mechanism in industry creates an interest in producing material-consuming products and not in reducing expenditures and prices for products.

In some sectors, for example instrument building, the planning of the wage fund in percentage of the volume of products sold (commodity) also operates in the same way. An increase in output in terms of prices (wholesale) may be achieved (for example, in machine building) by increasing the ratio of purchases from subcontractors, using expensive materials and raising the ratio of manual labor.

As a result of the imperfection of cost indicators for evaluating the activity of ministries, associations and enterprises intensive factors, including the possibility of ASU, are not utilized enough. This is indicated by data on expenditures for producing industrial products. Thus, expenditures per

*Chumachenko, N.G.; Zabotina, R. I., Economic efficiency of ASUP, Moscow "Statistika," 1977 pp 78-79.

ruble of commercial products in comparable prices are reduced annually by only 0.4 to 0.9 percent and in 1976 were even increased by 0.2 percent. These figures speak of a lag in solving the problem posed by the 25th party congress for reducing the 5-year costs per ruble of commercial products in industry by 4 to 5 percent.

The profitability indicator as a ratio of profit to the cost of productive capital plays a contradictory role in evaluating the activity of ministries, associations and enterprises. On the one hand, it stimulates better utilization of production capital, but on the other hand, it counteracts the increase in the capital-labor ratio and delays technical progress. However, the capital-labor ratio is still increasing at very high rates, providing the necessary increase in labor productivity. But what about the profitability? While profits in industry increased by 8.8 billion rubles in 1970 to 1975 inclusive, the profitability with respect to production capital decreased from 21.5 percent to 14.4 percent. This was due mainly to two reasons: wholesale prices were reduced by 4 percent and the capital-labor ratio increased by 52 percent.

The indicator of the ratio of profitability to production capital is useless for measuring the actual efficiency of production, including the effectiveness of ASU, and it must be eliminated from the number used. In this connection, it appears feasible to introduce in a number of industrial sectors a directive task on reducing the production cost of products instead of using an indicator of the ratio of profitability to production capital.

The elimination of the present profitability indicator and its replacement by another one will require the introduction of an indicator that would characterize the degree of utilization of fixed production capital. Such an indicator may be, for example, the production capacity utilization coefficient.

In our opinion, it is more correct to approve as directive indicators of activity plans of ministries, associations and enterprises the following:

The products list of the most important products;

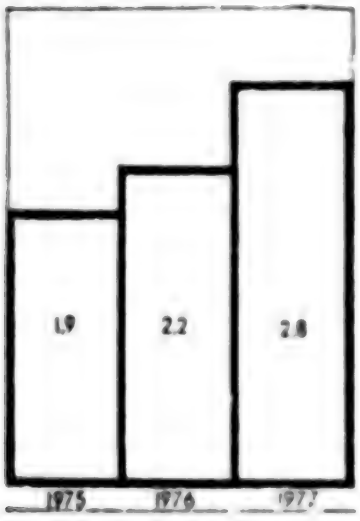
The ratio of new and highest category of quality;

Profits in rubles and in percentage of the wage fund;

Wage fund in rubles;

Coefficient of utilization of production capacity;

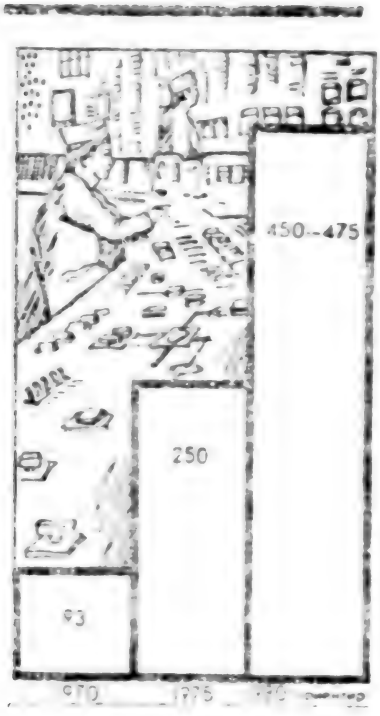
Rate of reducing expenditures for comparable products, fixed by the movement of the rated costs which it is proposed to add to wholesale prices for the products.*



Volume of computer and spare parts production in 1975-1977, billion rubles.

Note: Increase in computer production facilities compared to the previous five-year plan period: in the Ninth Five-Year Plan -- 4.3 times; in the 10th Five-Year Plan -- 1.8 times.

*We are talking about introducing two price list systems for products: wholesale (slow moving, changing once in 5 years) and rated (corrected annually, if necessary), planned on the basis of profit according to norms of the percentage to wages and not the production cost of products. This proposal was considered in detail in our article "Problems of increasing the efficiency of economic incentive in industry (EKO, 1971, No 6).

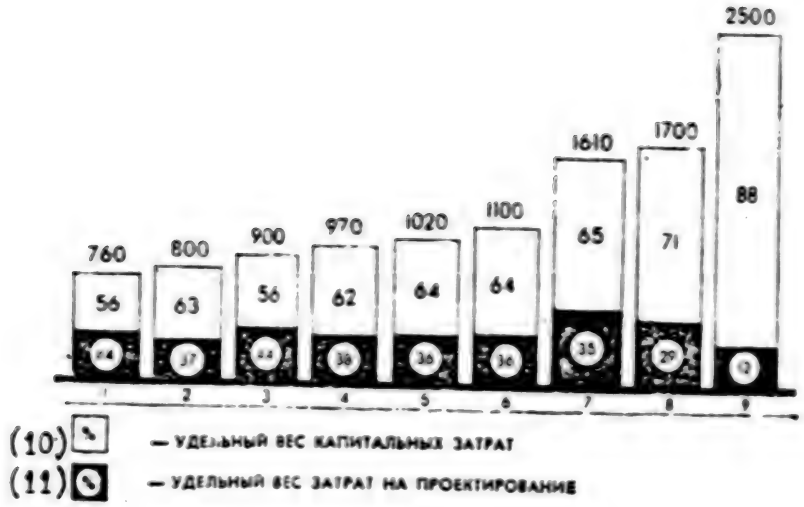


Number of people developing and introducing ASU in 1970-1980, in 1000 persons. 1980 estimated.

It is proposed to plan and take into account all indicators for the total increase in product shipments since the start of the year (deducting non-paying for products by consumers). This agrees fully with the measures adopted for strengthening business contract discipline. As is well known, since 1 January 1978, the evaluation of the volume of products sold is made by taking into account the fulfillment of obligations on deliveries. The sizes of bonuses to engineers, technicians and employees depend on this indicator. ASU can and should play an important role in providing strict observance of business contract obligations by enterprises and associations.

The sizes of economic incentive funds (FES) are planned by enterprises without norms and frequently without a tie-in with improvement in the most important indicators. To obtain proper FES, it is necessary to fulfill the plan for all approved indicators. Thus, enterprises and associations are interested in reduced plans. Such plans are frequently calculated by computers. In such cases, the ASU play an improper role, giving the reduced plans an appearance of objective calculations.

It would have been more correct to relate the sizes of FES calculated at the enterprises to three criteria: degree of plan fulfillment, achieved profitability level (ratio of profit to wage fund) and improvement in the indicators of the rate of activity. In this case, the main criterion for forming the FES must be the reduction of the production cost rate. FES norms may be taken in percentages of profits obtained from the sale (when shipped) of

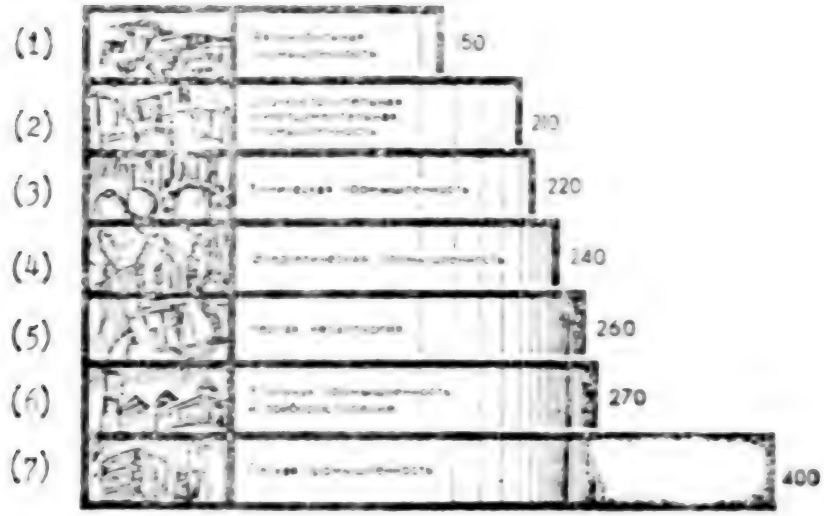


Money spent on creating ASUP [Automated Enterprise Management System] in industrial sectors in 1975, in 1000 rubles.

1. Minpribor
2. Minnefteprom [Ministry of Petroleum Industry]
3. Minlegprom [Ministry of Light Industry]
4. Minkhimmash [Ministry of Chemical and Petroleum Machine Building]
5. Minstankoprom [Ministry of Machine Tool and Tool Building]
6. Minavtoprom [Ministry of Automotive Industry]
7. Minsel'khozmash [Ministry of Tractor and Agricultural Machine Building]
8. Mintyazhmash [Ministry of Heavy and Transport Machine Building]
9. Minugleprom [Ministry of Coal Industry]
10. Ratio of capital investments
11. Ratio of design costs.

products at rated prices. Obviously, it is feasible to set minimum and maximum values of calculated FES. Under such conditions, only those ASU would be introduced that would save no less than the established norm.

Naturally, improving the economic mechanism in industry is of value not only for the effectiveness of ASU, but also for implementing other measures (modernizing enterprises, introducing new equipment and technological processes, more extensive specialization etc.).



Rate of increase in capital investments for introducing computers in some industrial sectors in 1976-1980 compared to 1971-1975, %

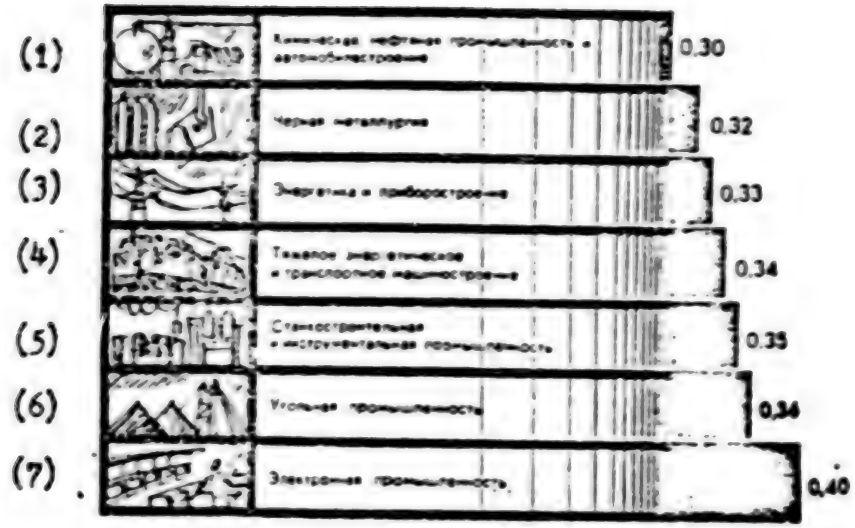
1. Motor vehicle industry
2. Machine tool and tool building industry
3. Chemical industry
4. Power industry
5. Ferrous metallurgy
6. Coal industry and instrument building
7. Light industry

Most Important Problem -- Development of Typical Design Solutions

How is the effect of existing ASUP obtained? This is done by regularizing the norms; improving the document turnover and requisites for documents carrying economic data; speed and authenticity in calculating plans and obtained data on the progress of production. The greatest effect from introducing ASUP is achieved in enterprises where this tool is used primarily by the first manager -- the director.

But this is only a part, a smaller one, moreover, of the effect that ASU can have. The basic effect is in the wide use of typical design solutions and economical levers in creating ASU, in improving the organizational structure of the enterprises and in the optimization of planning.

The present ASUP are individually designed, as a rule. They specify the mechanization and automation by computers of planning and production record-keeping operations basically in the shape that they are formed at each enterprise. It cannot be said that typical design solutions were not given attention. For many years, many millions of rubles were spent on their development. In recent years, they are being developed in the form of so-called applied program packets (PPP).



Norm coefficient of effectiveness of capital investments for introducing computers for several industrial sectors in 1974

1. Chemical , petroleum industry and motor vehicle building
2. Ferrous metallurgy
3. Power and instrument building
4. Heavy power and transport machine building
5. Machine tool and tool building
6. Coal industry
7. Electronic industry

A number of packets have already been created but they are not being disseminated widely because they were developed basically by mathematicians not supported by preliminary economic investigations and such improved organizational-economic systems of production control that could be called typical.

In this connection, it is necessary to avoid decisively the concept that ASU is only the mechanization (automation) of planning and production record-keeping by means of computers. It is more correct to begin ASU development by perfecting the very content of the management system -- its organization-economic elements (the production structure, methods of planning and accounting, cost accounting). Only after that does it become effective to develop the economic-mathematical models, the algorithms etc. In this case, taking

into account concrete conditions of enterprises and associations, such typical solutions on improving organizational-economic management systems that produce the greatest economic effect should be implemented.

The expansion of economic investigations of enterprises problems may produce a double gain: by improving the economic mechanism (independently of computers) and by a sharp reduction in the volume of software which makes up more than half its cost since, at many enterprises, the same programs can be used on the computers without change.

The need for using a number of enterprises and associations for the experimental checking of the results of investigations on improving the economic mechanism is obvious. Only then can the following step consist of transferring successful experiments onto the shoulders of computers and developing design solutions in PPP form for use on similar projects.

Work on improving the economic mechanism and, if necessary, legal formulation of respective documents, finishing off PPP -- these are the most important, high priority stages in the total process of improving the management of the national economy. Therefore, enough resources should be allotted and acceptable schedules be established for this purpose.

Abolish Planning ASU in Pieces. The Main Goal -- Effectiveness

Why are optimization problems poorly implemented although many economic-mathematic models have been developed?

There are several reasons. We will name a few of them:

Preservation of the practice of planning ASU in pieces;

Insufficient capacity (speed of operation and working memory) of the most commonly used computers (YeS-1022, ASVT-M-4030);

The imperfection of optimizing models, as well as their software;

The high laboriousness of providing data.

Of the reasons mentioned, the main one is the first. In this case, according to official handbooks, "piece" means a certain set of subsystems and problems for enterprise management. The more "pieces" that are developed and introduced, the better it is considered that the organization operates. Of secondary importance is the quality and effectiveness of these "pieces." Therefore, institutes and design bureaus are interested in developing ASU with the smallest possible number of problems, concentrating their attention on mechanizing the simplest problems by means of computers. It is unprofitable for institutes and design bureaus to create more complicated and effective ASU, including the basic ones and develop them and solve problems on optimizing planning.

Many enterprises turn to scientific-research institutes and design bureaus with requests not to create ASU with all the subsystems and problems which require a great amount of money, but to do individual jobs: calculate an optimal production program, improve the production structure, do the cost accounting etc. Orders for such jobs are not accepted because they are not compensated for by the number of ASU. The evaluation of the activity of scientific research institutes and design bureaus by the number of ASU lessens the attention given to scientific research work. Therefore, in particular, NII [Scientific research institute] and KB [Design bureau] which develop ASU, almost never do research on improving the economic mechanism. Neither are they interested in giving scientific-methodological help to enterprises and organizations and propagandizing scientific-technical knowledge (in publications, lectures, conferences and seminars).

In the interest of increasing the effectiveness of NII and KB which develop ASU, it is feasible to abolish the evaluation of their activity in pieces, and at the same time, provide for the expansion of their functions on helping industry to improve production control. The basic indicators should be the targets of the most important subjects and the effectiveness of the developments introduced. The size of incentives should correspond primarily to the effectiveness of the developments introduced. A decision on this was adopted. In the very near future, all NII and KB which develop ASU are being changed over to an incentive system, following the example of the electric equipment industry which is dependent upon the size of the additional profit the customer actually obtains by introducing ASU.

Improve Provisioning of ASU with Technical Facilities

There are great reserves for raising the effectiveness of ASU by providing them with technical facilities. As shown by analysis, poor operating data of many existing enterprise ASU are due to insufficient peripheral devices. At a number of machine building enterprises, after releasing ASU for industrial operation, many problems on operational production control and material-equipment supply could not be handled because of a lack of production recorders. Computers are not provided with external and, especially, with working memories.

At the All-Union Conference on Management Problems held in 1977 at the Novosobirsk Akademgorod, the following fact was cited. Three third-generation computers function at a plant. They are all of the so-called basic form, i.e., they do not have external devices. Two machines, after great effort, were provided with displays and additional disc carriers. But since it was impossible to "obtain"at least one more memory unit for each machine, it is impossible to change over to a multiprogram mode that would allow the approximate doubling of the output of the machines. Thus, due to a lack of two memory units at a total cost of 120,000 rubles, a machine costing over a million rubles is extremely underutilized.

Not only are computers of single series such as the ASVT-M-4030 and the like needed but also minicomputers for solving a certain class of problems in ASU, including local problems. This is in line with the modern practice of creating and developing a multilevel ASU with a distributed data base along management steps (shop, enterprise, association). Most important is that the expenditures for ASU with the same functions drop sharply because minicomputers are considerably cheaper than computers of a single series and are much cheaper to operate. Briefly, there is an acute need for a sharp increase in the production of a minicomputer series and its ratio in the total computer pool of the country. At the same time, it is necessary to accelerate the creation of large interindustrial computer centers for collective use for solving complex problems of optimal planning and servicing in small enterprises.

Introduce Assimilation Stage of Rated Capacity of ASU

According to existing manuals, it is considered that ASU functions at full capacity on the second day after it is released for industrial operation. However, this is not so. Actually, it is at least 1 - 1-1/2 years after the start of operation before ASU works at full speed. And there are serious reasons for this which are impossible not to take into consideration. Therefore, it would be proper in manuals to plan for the assimilation of the ASU rated capacity by placing, during this period, corresponding obligations on the customer as well as the developer. This job can only gain from this.

ASU Must Be Developed by Specialized Organizations

Creating an ASU is a complicated and expensive job. All of them, in the final analysis, must make up a single general government system of collecting and processing data for controlling the national economy. Therefore, they must be designed on a single methodological technical base and with program software. For this reason, amateur work is impermissible. The development of the ASU is a problem for large specialized scientific-research and planning-design organization. Meanwhile, a mass of small organizations has sprung up in recent years. Each one designs his "bicycle."

The government allots huge sums of money to improve the system for managing the national economy by means of computers and they must be utilized efficiently. The economic mechanism of management and automation on the basis of computers and economic-mathematical management methods must clearly orient each association and enterprise to implementing the principle: "Produce more products of higher quality with minimum current and capital expenditures."

Conditions at Which Development of ASU Must Begin

Up to 1977, the basis for starting work on an ASU at an enterprise or association in industry were orders, decrees etc. In 1977, in accordance with the decree of the GKNT (State Committee of the Council of Ministers, USSR, on Science and Technology), a procedure was introduced in which work on creating ASU could not be started without preliminary technical-economic substantiation. The main condition for allotting the necessary resources to create

an ASU was the requirement that the planned coefficient effectiveness of the expenditures for ASU must be not less than the norm. It is important that this be strictly observed.

As shown by experience, planned effectiveness of ASU is achieved, as a rule, by the following basic conditions:

Work be done by specialized organizations;

A collective of specialists on developing and operating ASU be trained and formed in the proper time;

Necessary technical facilities including computers and production recorders be available and put in operation at the proper time;

Norms and functions be created in advance.

Of the conditions enumerated, the most complicated in practice is creating norms. It is their very imperfection (lack of substantiated norms on material consumptions, wages etc.), as a rule, that is the main reason that created ASU do not produce the expected yield.

Satisfactory norms are the basis of successful production control independently of whether or not there is a computer at the enterprise, association or industry. In this connection, it appears feasible that the availability of satisfactory norms be made one of the compulsory conditions for allotting money for creating ASU.

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USSR

NUMBER OF COMPUTERS IN UKRAINIAN SSR

Kiev PRAVDA UKRAINY in Russian 4 Apr 79 p 1

[Editorial: "The Potential of Science"]

[Text] On the occasion of a general meeting of the Ukrainian Academy of Sciences, the newspaper's lead editorial discusses several tasks currently confronting Soviet scientists. One of these concerns computers. There are currently operating in the Ukrainian SSR more than 2,500 computers, more than 500 automated management systems (ASU) and on the order of 1000 computer divisions and centers. The task before scientists is more rapidly to assimilate third-generation computers and to use all computers more efficiently.

CSO: 1863

USSR

PAPERS CONSIDERED FOR STATE PRIZES

Moscow IZVESTIYA in Russian 17 May 79 p 3

[Article: "From the Lenin and State Science and Technology Prize Committee of the USSR Council of Ministers"]

[Excerpts] The Lenin and State Science and Technology Prize Committee of the USSR Council of Ministers announces the acceptance of the following works for consideration in the competition for the 1979 USSR State Prizes:

45.Gusev V.F., Ivanov V. N., Knyazev G. I., Korotchenya M. I., Lenkova V. M., Mel'nikov V. V., Malashchitskiy G. V., Rostovtsev I. K., Semikov Yu. T., Shaguivaleyev M. Z., Sharunenko N. M. "The Creation and Application of the Large-Series Unified System YeS-1022 and YeS-1033 Computers." Sponsored by the Ministry of the Radio Industry.

51.Anishchenko P. M., Abrosimov V. N., Anodina T. G., Dubrovin G. I., Lapin B. A., Lur'ye L. O., Obukhov V. I., Spirov S. V., Solov'yev A. A., Smirnov L. L., Semenov L. G., Shelgunov A. A. "The Development, Series Production and Application of the 'Start' Automated Air-Traffic Radar Control System for High Density Airports (AS UVD 'Start')." Sponsored by the Ministry of the Radio Industry.

CSO: 1863

B. Problem Areas

Translations of Articles

A HEAVY LOAD FOR COMPUTER TECHNOLOGY

Moscow LENINSKOYE ZNAMYA in Russian 27 Mar 79 p 1

[Editorial: title as above]

[Text] Soviet scientists are constantly aware of the Party's and the government's immense concern about the development of science. This unceasing concern manifests itself primarily in the creation and strengthening of the material and technical base of scientific establishments. Today's researchers have at their disposal the most up-to-date facilities for performing their work. Scientific and technical progress makes it possible to mechanize and automate the intellectual activities of man on a large scale. It is no accident that the automation of research with the help of computer technology is becoming ever more widespread.

Many scientific research institutes and design offices in Moscow Oblast are now equipped with computer facilities. Large computing and information centers containing powerful computers (including third-generation machines) have been set up in some institutes and design offices. Many of the most diversified problems are being solved with the help of computers, with primary emphasis on the automation of planning and design work, mathematical modeling of the parameters of new technology is being carried out, and complex engineering projects are being performed. Computers have vast capabilities in the area of processing huge volumes of information in the shortest possible time.

However, it is completely obvious that the marvelous possibilities and capabilities of computer technology do not exist as independent phenomena, but appear only when a computer is used intelligently and rationally. The computing and information centers of the Kriogenmash scientific production association, the Mining Institute imeni A. A. Skochinskiy, and a number of other scientific establishments function effectively and with a high output. In these establishments, the organization of work utilizing computers has been clearly thought out and almost around-the-clock functioning of the computing

and information centers has been set up. Planning of the machine workload and careful accounting of machine time make it possible to use the equipment for maximum output.

It is widely known that the use of computers makes it possible to shorten the time required for scientific research and development, accelerate the introduction of the results of this work into practice, and--in the final account--increase the effectiveness of science. The 25th CPSU Congress specified the acceleration of scientific and technical progress as a goal of primary importance. In these times, achieving it would be unthinkable without the use of modern research methods, including the extensive utilization of computer technology.

Unfortunately, however, expensive and highly productive computers are used poorly in some institutes and design offices. Sometimes a computer is used no more than 3-4 hours a day. The Moscow Oblast People's Control Committee recently checked the effectiveness of the operation of computers in a number of scientific research institutes and design offices. Serious flaws in the use of the computers were discovered, the most important of which were violations of the technical conditions for computer utilization and a failure to account for machine time; these flaws were seen in a majority of the institutes.

One of the most common shortcomings is a lack of preparedness on the part of the institute or design office to make proper use of computer technology. Expensive machines are acquired long before normal conditions for the efficient operation of electronic equipment are created in an organization. Because of the absence of the necessary programs, inadequate software, and the lack of preparedness of maintenance personnel, complicated equipment stands idle for long periods of time. That was the situation at--for example--the All-Union Scientific Research Institute of Silviculture and Forestry Mechanization and the Istrinskiy branch of the All-Union Scientific Research Institute of Electromechanics.

The demands made of computer programs become greater every year. Programming has become the essential factor that determines the effectiveness of computer technology utilization. This is why, in solving the important problems related to increasing computer loads, party organizations and the leaders of scientific establishments must be primarily concerned with the development of those programs that would to the greatest extent fit in with and contribute to the solution of the problems facing the scientific collectives. In connection with this, one situation that deserves criticism is the way things are done at the All-Union Scientific Research Institute of Hydrogeology and and Geological Engineering, where the recently acquired computer complex is used primarily to solve petty problems of secondary importance and to do accounting work. At the same time, many requests of the institute's subordinate scientific units concerning the processing of research results are not taken care of.

Thus, the right way to do things is not to load a computer any which way in order to formally achieve decent indicators, but to know how to use the vast capabilities of computer technology in order to achieve the greatest output.

At the State Scientific Research Institute of Mined Chemical Raw Materials, the computer load is planned only a day or two in advance. There are no work plans for the month or the quarter. Given this state of affairs, we cannot speak of the effective use of computer technology. Moreover, the matter of accounting for the machine load is in a mess at the institute. To a large degree these shortcomings can be explained by the poor qualifications of the workers in the mathematical methods section who service the computer. Incidentally, more than half the workers in this division are not specialists in the field of computer technology and mathematics.

The selection and training of personnel to work with computers is a matter of the utmost importance. Special knowledge, experience and ability are needed by people who are charged with the extremely critical task of operating this complex equipment. The duty of the party organizations and the leaders of scientific and planning and design establishments is to take unremitting control of the job of selecting and training these people. It is important to think through and organize socialist competition among the workers servicing computers and to see that a rational combination of measures for both moral and material encouragement contributes to the growth of the specialists' creative activities.

At times, unjustified down time and low computer loads are related to low quality of the machines' technical maintenance and repair, which is performed by workers from the Soyuzkhimpribor production association. Employees of computing and information centers make justified complaints against this organization. The repair workers violate contracts that have been agreed upon, pay flying visits to scientific research institutes and design offices, and react to calls for service on an untimely basis and with delays.

Comrade L. I. Brezhnev, speaking at the 25th CPSU Congress about the problems of concentrating forces and resources to carry out the most important State-wide programs, emphasized the importance of introducing modern scientific methods--including those developed by mathematical economics--including those developed by mathematical economics--and the necessity of using automated management systems. The Party's requirement for the effective, widespread utilization of computer technology must be strictly implemented by every party organization and each communist.

11746
CSO: 1863

C. Production Plants

Translations of Articles

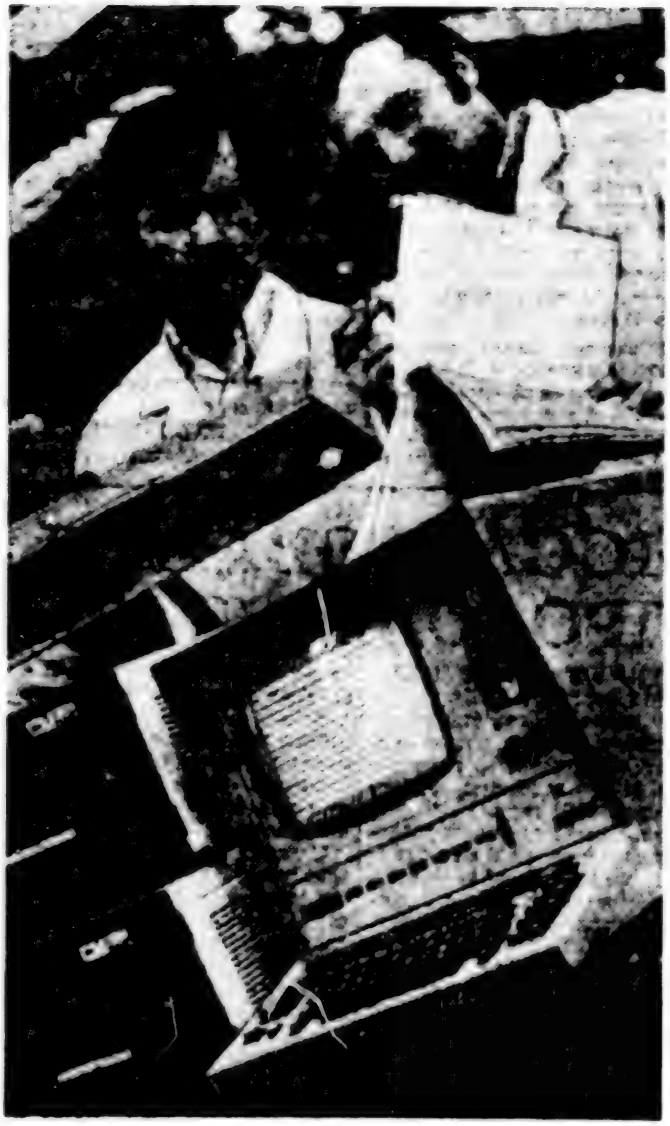
USSR

PRODUCTION OF AKKORD AT ODESSA COMPUTER PLANT

Kiev PRAVDA UKRAINY in Russian 6 Apr 79 p 2

[Photo and Caption]

[Excerpt] At the Odessa Computer Plant, for the first time in the Soviet Union, production has begun on the Akkord, an information preparation device for computers. By the end of the year hundreds of units will been produced.



Abstracts of Articles

USSR

MINSK EXPERIMENTAL COMPUTER REPAIR AND SERVICING PLANT

Minsk SOVETSKAYA BELORUSSIYA in Russian 17 Jun 79 p 2

[Abstract] An electronic-keyboard computer repair brigade at the Minsk Test and Experimental Computer Repair and Servicing Plant is achieving excellent results in the socialist competition. The brigade is five months ahead of its work schedule. The photograph shows members of the brigade working at the plant.

CSO: 1863-P

D. Unified System or Ryad Series

Translations of Articles

RYAD-2, A NEW FAMILY OF COMPUTERS

Moscow PRAVDA in Russian 14 Jun 79 p4

[Article by P. Pleshakov, Minister of USSR Radio Industry]

[Text] On June 14, at the Exhibition of USSR National Economic Achievements, in connection with the 30th anniversary of the CMEA and 10th anniversary of the signing by governments of the socialist countries of the Agreement on Cooperation in Computer Technology, opens the exhibition "YeS and SM Computer Hardware and Their Application". At it are represented six models of the unified system of computers of the second phase, four models of the family of mini-computers and over 100 types of peripheral devices for collection, storage, display and output of information. All technical hardware is displayed operating in functional systems of collection and processing of data of various designation, including remote processing of information transmitted along communication lines.

"Along the paths of economic integration, the power and solidarity of friendship of the lands of socialism is being strengthened", noted comrade L. I. Brezhnev at the 25th CPSU Congress. Reality confirms this by a multitude of factors of fruitful joint activity of enterprises and organizations of the socialist countries in the most diverse sectors of economics, science, technology and culture. By bringing to life the long-term Comprehensive Program of Socialist Economic Integration, countries of the socialist collaboration are jointly assimilating natural resources, erecting enormous industrial complexes and planning ahead for many years the cooperation between enterprises and whole industrial sectors.

No small role in the fulfillment of this program belongs to joint elaboration and production of computer hardware. Its creation requires the efforts of great scientific research and design teams, significant industrial capacities and capital investments. In view of this, governmental organs of the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Republic of Cuba, the Polish People's Republic, the Socialist Republic of Romania, the Union of Soviet Socialist Republics and the Czechoslovak Socialist Republic concluded the Agreement on Scientific and Technical Cooperation in Elaboration and Production of Computers. In this fashion efforts were united to create the Unified System of Computers (YeS EVM).

In accordance with the agreement, an intergovernmental commission on computer technology was created. It is charged with problems of unifying and coordinating efforts of cooperating countries in the conduct of scientific research and testing and design studies based on unified technical policies, division of labor and cooperation. To solve scientific and technical, economic and organizational problems, the commission has set up councils—of chief designers, on economics, complex maintenance of computer hardware and their application, working groups on microelectronics, standardization, technological equipment and sensing and measuring devices.

The work of the intergovernmental commission is performed on the basis of the principles of coordinated division of labor between countries, allowing for their scientific and technical progress and industrial resources. In the past 10 years, several projects in creation of technical media and program-software of the unified systems of computers and mini-computers have been realized. This made it possible to supply the brotherly countries with unitied computer hardware in place of the variety which existed until recently. The broad unification of technical decisions, systems architecture, methods of coupling devices and program-software, interfacing computers and remote processors, formats and physical methods of input and encoding of data, design and technological solutions, servicing equipment and methods of device planning, programming languages and systems operation control became the fundamental basis for the projects realized.

The comprehensive standardization became the core which permitted the harmonious working of numerous teams of the participating countries in the creation of modern computer hardware which has technical, informational and programming compatibility. The set of mutually correlated standards was developed quickly and was used to introduce the corresponding national standards for computer hardware. This made it possible to create unified program-software for all types of computers, a wide pool of I/O devices compatible with any computer in the system, standardization of remote processors and data transmission devices and, what is very important, to achieve total compatibility of computers within the programming systems adopted.

Specialization of participating countries in specific kinds of production and mutual cooperation of production governed the high technical level of items produced, opened paths for further development of computer technology in each country. The unified technical computer servicing corps organized later assured users of profitable conditions for setting up computing centers because of centralized delivery and hookups of computers in necessary configurations and made it possible to organize high-quality warrantee and post-warrantee repair of hardware and training of personnel.

The first results of cooperation in this field were presented at the international exhibition "Unified System of Electronic Computers of Socialist Countries" held in Moscow in 1973. The first six types of third-generation computers with productivity ranging from 10,000 operations per second (YeS-1010) to 500,000 operations per second (YeS-1050) and more than 120 different I/O devices were demonstrated there. The consensus is that the exhibition showed broad possibilities and also great political and economic value of scientific and technical cooperation between socialist countries. An important achievement was the emergence of socialist countries into leading positions in the business of comprehensive study, production and delivery of computers.

In recent years, qualified scientific and industrial teams have been put together in cooperating countries; a powerful industry was set up to produce computer hardware and operating plants have been outfitted with the latest technology and machine tool equipment; new enterprises have been built. International division of labor and profound specialization of production of computer hardware assured the significant growth of turnover of merchandise among countries participating in the agreement.

Study and assembly-line production set-up of the second phase of technical and programming media of the unified system of Ryad-2 computers are now coming to a conclusion. This system consists of seven computer models with a range of productivity up to 5,000,000 operations per second. The machines have the best technical and economic indicators, attained because of the use of highly-integrated solid-state components. The Ryad-2 computer differs from the Ryad-1 system in its more perfect logic structure, increased productivity of CPUs (up to 5,000,000 operations per second) and the possibility of creating multi-machine complexes and other features.

In addition, in the Ryad-2 family parameters have been substantially increased, reliability has been enhanced significantly and the range of I/O devices has been expanded. Magnetic disk memory capacity has grown from 7.25 megabytes to 100-200 megabytes; the rate of alphanumeric printout has doubled; the input density and exchange rate for magnetic tape memories has increased significantly. Remote processing media number over 40 items and including communications modems, data transmission devices, various types of user terminals, permitting the creation of varied-purpose remote data processing systems.

At the same time, the development of unified computer systems and minicomputers establishes conditions for efficient utilization of computer technology in control of technological processes and equipment, automated management systems for enterprises and industrial sectors, information reference systems of varied purpose, in automated processing of results of scientific research and in planning and design work.

A broad program of future development of technical and programming media of unified systems of electronic computers and mini-computers is currently being elaborated; it specifies the creation of new devices with higher productivity, better technical and economic indicators, expanded resources of data processing. They are being created on the basis of utilization of modern achievements of microelectronic technology—microprocessors, LSI circuitry, elements and memory devices based on new physical principles. These studies will serve as an important factor in further deepening and development of socialist integration, strengthening the economic power of countries of the socialist camp.

CEMA COUNTRIES EXHIBIT YeS AND SM COMPUTERS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Jun 79 p 1

[Interview]

[Excerpts] Today at the Exhibition of Achievements of the National Economy of the USSR in Moscow the exhibit "Equipment of the Unified System of Electronic Computers (YeS EVM) and the International System of Small Computers (SM EVM) and their application" is being opened. In the year of the 30th anniversary of the CEMA the eight countries of socialist collaboration are demonstrating in its exhibits the results of joint efforts in the area of the creation of computer equipment--new electronic computers and peripherals, control and computer complexes for the solution of various problems. Here is what V. V. Przhiyalkovskiy, general designer of the YeS computers and director of the Scientific-Research Center of Electronic Computer Technology, says about the exhibit.

The "Ryad-2" system includes seven electronic computers and about 150 peripheral devices. In comparison with the YeS EVM "Ryad-1" the central processors of the YeS EVM "Ryad-2" have 10 times the capacity, and the magnetic disk stores are 15 times as large.

The present exhibit, speaking figuratively, sums up the "Ryad-2" program. The novelty of the displayed items is shown by the fact that only three of them were demonstrated in 1973. Among the novelties one must mention the "VK2-R60" two-machine complex, with a productivity of 2 million operations per second, which at present is the most powerful general-purpose computer system of countries of socialist collaboration. Its peripherals permit 80 subscribers to use the complex together practically simultaneously.

The main distinctive feature of the YeS-1055 computer, created by specialists of the GDR, is a main semiconductor memory, which is more economical to produce than the traditional ferrite memory because of lower labor-intensiveness in the manufacture of circuits. But the main gain is speed.

It is precisely that computer which services the information and reference system of the exhibition.

If you need a drawing or a diagram, the YeS-1055 can work in a team with a graph-constructor. And a microfiche attachment permits obtaining from the archive stored in the computer memory drawings or textual material in the form of a microscopic negative.

The YeS-1035 computer, created jointly by specialists of the USSR and the People's Republic of Bulgaria, is especially convenient for matrix calculation, a special class of problems arising during the planning or conducting of scientific experiments. A special matrix processor which increases the speed of the machine by more than 30 times is connected to the computer. The external memory of the computer consists of magnetic disk and magnetic tape stores. The very rapid "5003" tape-winding mechanism is also employed. Bulgarian specialists have succeeded in increasing its speed several times by increasing the density of recording on magnetic tape and improving the electromechanical system.

Within the framework of the YeS EVM program Hungarian specialists have been entrusted with the creation of small computers and peripherals: displays, subscriber points and multiplexors of data transmission. It must be acknowledged that they have excellently coped with the task: an entire series of systems with the use of Hungarian equipment is being demonstrated at the exhibition.

One of the promising directions in computer technology is the replacement of traditional punched cards by flexible magnetic disks. That equipment for feeding data to such carriers, the YeS-5074, is being demonstrated by our Czechoslovak colleagues. They are also showing the small YeS-1025 computer.

Besides machines of the YeS EVM system, control computers of the SM series are being widely displayed at the exhibition. They have been successfully paired with YeS EVM machines into flexible complexes for the control of technological and production processes.

2174
CSO: 1863

NEW ACHIEVEMENTS FOR UNIFIED COMPUTER SYSTEM SHOWN

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Jul 79 p 4

[Text]

The international exhibit "Unified Computer System and Its Use" continues at the Exhibition of Achievements of the National Economy of the USSR in Moscow. In its booths the countries of the socialist concord are celebrating the 30th anniversary of CEMA by demonstrating the results of their joint efforts in the field of creating electronic computer technic. Today we talk about some of the things seen in this exhibit.

YeS-1060 Computer

The fastest of the second-generation "Ryad-2" machines in the socialist countries' unified computer system is the YeS-1060, which was built by Soviet specialists. It is capable of processing huge masses of information at a speed of up to 1.2 million operations per second. The area of application of the YeS-1060 is large computation centers and large information and multimachine systems. For the solution of complex scientific and

technical, economic planning, and control problems, the machine can be augmented with two selector subchannels and one multiplex channel, which allow a large amount of input/output equipment to be connected.

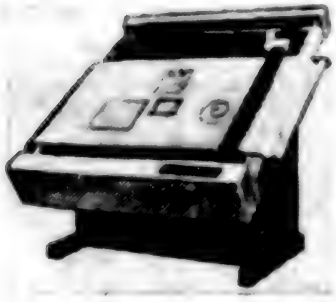
YeS-7902 Punched Paper Tape Preparation Unit

Modern computers are capable of issuing finished programs, in the form of punched paper tape, for many models of machine tools that have digital program control. The YeS-7902 station, which was developed by specialists in the GDR, is intended for the preparation of punched tape. It consists of two control units and two input and output units. Punched paper tape can have from five to eight tracks, which makes it possible to use almost any code for the programs.

SM5400 Storage Unit With Replaceable Magnetic Disks

The functional capabilities of small computers are greatly enlarged if they are paired with the SM5400 storage unit, which has replaceable magnetic disks. This unit was developed by Bulgarian specialists, and in the version with a permanent disk and a replaceable reel, it can have an information "bank" capacity of up to 50 million bits. The disk's turning speed (2,400 revolutions per second) is maintained with high accuracy by mounting the disk reel directly on the motor's shaft, which eliminates intermediate drives. The ventilation system is fitted with air filters that trap up to 97 percent of the dust particles more than 0.3 microns in diameter.

YeS-7054 Plotter



For a specialist who turns to a computer for help when solving design and planning problems, it is not good to receive an answer in the form of text or a table of numbers. He could evaluate the results of his solution much better if he were presented with drawings, graphs, or diagrams. This is exactly what is done by the YeS-7054 plotter, which was developed by Czechoslovakian specialists. With its help a computer can produce a graph, drawing, map, or plan in a format up to 1,600 x 1,200 mm in size and on scales of 1:1, 2:1, or 1:2. If a special program is entered in the computer, then it is possible to obtain a four-color graphic image.

YeS-7168 Alphanumeric Display

The integrated circuits used in the machines of the unified computer system have given rise to special requirements for even such design elements as the keyboard on the consoles of different units. As it turned out, at the moment when the electrical circuit at the contacts closes when a key is depressed, strong pulsing currents appear that are capable of distorting the

registration of the information. In order not to have to use special shielding against interference and to increase the "purity" of the recording, special noncontact electronic devices have been developed. They are also equipped with the YeS-7168 alphanumeric display, which was created by Hungarian specialists. Its keyboard consists of 26 Latin capital letters, 10 digits, 28 punctuation marks, and the 31 letters of the Russian alphabet.

YeS-7186 Printer

No matter how fantastically fast a computer can operate, its "quickness" can prove to be useless if the unit used to issue the results does not have the necessary high-speed qualities. Using this viewpoint to evaluate the merits of the YeS-7186 printer, developed by specialists from the Polish People's Republic, we can say on the basis of its productivity, it can be paired with any modern computer. The printing head, which is mounted on a moving carriage, can print up to 180 symbols per second on paper tape. The symbols are printed in the form of a matrix of 7 x 7 symbols. However, even this "machinegun" speed would hold the computer's operation back if the unit were not equipped with a buffer memory: by storing the information for the next line in this memory, the control unit "allows" the computer to continue its calculations without interruption.

11746
CSO: 1863

E. Hardware

Translations of Articles

UDC 621:658.53: Δ621.3.523.8

COMPUTER THROUCHPUT STANDARDS DISCUSSED

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 5, 1979 pp 38-39

[Article by A. R. Myagi, candidate in Technical Sciences: "Computer Throughput Standards"]

[Text] Accompanying the increase in the number of computers introduced into operation in the national economy is the growing urgency of the need for an objective evaluation of the degree to which they are being utilized. The degree of computer utilization is currently being determined by comparing actual average daily use (in hours per calendar day) with the corresponding norms established by TsSU SSSR [Central Statistical Administration of the USSR]. But the time spent in the performance of any given operation provides no indication of the amount of work actually done. We can properly develop some idea of the degree of a computer's utilization only by comparing the actual amount of work performed on the average per unit time with the corresponding norm. We may employ as such a standard a computer's average hourly throughput, which it is then necessary to compare with its actual average hourly output (both values expressed in terms of characters of input information processed by a certain type of computer in the course of an hour).

Average hourly throughput does not depend on a standard average hourly utilization T_{day} (or planned average hourly use), which varies abruptly and irregularly as a function of nominal computer output capacity (20, 15 or 6 h/day) and the interval of time elapsed from the moment the computer's operation is begun. Average hourly throughput therefore makes possible a clearer comparison of the actual output capacity of various types of computers than a daily, monthly or yearly throughput. The introduction of a new indicator, actual

average hourly output, makes possible a substantially more accurate characterization of the degree of computer utilization and a comparison of the results of the operation of VTs [computer centers] equipped with different types of computers.

The establishment of norms for average hourly computer throughput will make it possible in the future to develop a schedule of the costs of VTs services based on the volume of work actually performed, which is a most important economic lever for increasing the efficiency of computer utilization.

The calculation of a computer's throughput capacity is a complex problem since it is a function of a large number of factors: the hardware and the software involved, processor capacity, the organization of VTs operations, the composition (complexity) of the jobs to be executed and so forth.

It is to advantage to calculate average hourly computer throughput standards on the basis of the rated processor capacity determined in accordance with GOST [All-Union State Standard] 16325-76. This assumes that the system includes input-output equipment and working storage in sufficient number and capacity to insure maximum effective processor utilization.

According to GOST 16325-76, the rated processor capacity in P_c instructions/s is to be calculated separately for scientific-technical and economic-planning jobs without regard for delays caused by waiting for the execution of input-output operations. Throughput standards for both types of jobs should therefore vary.

Throughput capacity for YeS EVM [unified computer system] is calculated by a specially developed program for measuring the time required for the execution of instructions*.

Given consideration of the various inevitable losses in processor capacity occurring during operation, average hourly computer throughput capacity may be calculated in accordance with the following empirical formula:

$$N = 3600 \frac{CP_k}{n}, \qquad (1)$$

where N - average hourly computer throughput in characters/h; n - average number of instructions per character of input information; C - multiple coefficient taking into consideration the various losses; P_k - rated processor capacity in instructions/s.

*Ye. A. Koshman and S. P. Solov'yev, "Evaluating the Rated Capacity of General-Purpose Computers," PROBLEMS IN RADIOELECTRONICS, ser. EVT, No 5, 1977, pp 60-70.

For ASU [automated management system] jobs during the period 1976-1980 (according to data from GPKI ASU [State Institute of Automated Management System Planning and Design]), Ivanovo, n = 300 instructions/character; during the period 1981-1985 n = 660 instructions/character; during the period 1986-1990 n = 1500 instructions/character; on the average, n = 2000 instructions/character in the case of scientific-technical jobs**. The multiple coefficient C is defined as the product of the partial coefficients $C = C_1 C_2 C_3 C_4$, where C_1 - coefficient taking account of the arrival of data at irregular time intervals, $C_1 = 0.8$***; C_2 - coefficient of reduced capacity due to accessing peripheral equipment; in the case of computers operating in a multiprogram mode, $C_2 = 0.8$, while in a single-program mode $C_2 = 0.2$***; C_3 - coefficient accounting for the time required for the execution of jobs by automatic programming and the realization of service programs, $C_3 = 0.83$***; C_4 - coefficient taking account of losses resulting from the organization of operations within the VTs, $C_4 = 0.4$-0.67***, it taken on the average to be 0.45.

Taking the foregoing into account, C in the case of single-program computers equals $0.8 \cdot 0.2 \cdot 0.83 \cdot 0.45 = 0.06$, while for multiprogram computers C = 0.24. Since most computers are delivered to purchasers in the form of a basic system, which does not allow efficient operation in a multiprogram mode, for the first year after a computer has been put into operation C_2 for all computers may be taken as equal to 0.2, $C_4 = 0.4$ and C, therefore, equals 0.04. On the basis of its actual operational capability, it is advisable in the case of the Minsk-32 computer to take C_2 as equal to 0.4, C = 0.12.

All of the coefficients which have been enumerated may, if necessary, be further differentiated in accordance with a computer's special features, the entire system of which it is a part, the operational system employed and so forth.

Based on rated capacity P_k, and taking into consideration the values of C and n given above, standard computer throughputs are shown in the table (in thous. characters/h). In the case of scientific-technical jobs, 80 percent is taken in accordance with GOST 16325-76 as the figure for the proportion of instructions executed with double-length operands in this regard, 20 percent with single-length operands.

**Estimates of the numerical values for n in published sources vary to a considerable degree. Thus, according to data from Gosplan USSR (Yu. P. Lapshin. The Development of Industrial Automated Management Systems. Moscow, Ekonomika, 1977), in 1980 n = 5000 instructions/character.

***Metodicheskiye materialy po tipovomu sostavu tekhnicheskogo zadaniya no proyektirovaniye vychislitel'nykh tsentrov [Guide to Methods of Compiling Standard Production Tasks for the Planning and Design of Computer Centers]. Moscow, Statistika, 1970.

Computer Throughput Standards

Type of Computer	Economic-planning Jobs	Scientific-Technical Jobs
Minsk-32	18.0	-
YeS-1020	36.7	4.7
YeS-1022	140.3	34.6
YeS-1030	50.5	24.8
YeS-1032	252.0	98.4
YeS-1033	200.2	72.2
YeS-1035	175.1	60.8
YeS-1040	326.9	155.3
YeS-1050	233.3	184.3
YeS-1060	517.0	422.1

Note: Figures are lacking for the Minsk-32

The average value n = 600 instructions/character has been adopted in the case of economic-planning jobs. When the actual proportion of complex jobs executed within specific computer centers exceeds the national average, that is, n = 600, it will be necessary to adjust the standard average hourly throughout accordingly (to lower it).

The norms given here are applicable to single-processor computers if they are employed primarily in industry for the execution of ASU jobs reiterated at regular intervals or of scientific-technical jobs.

Average daily processor time $T_{pr.day}$ may also serve as a norm permitting an evaluation of the efficiency of computer utilization. On the basis of the foregoing, the standard average daily processor time $T_{pr.day} = CT_{day}$. The actual processor time T_{pr} required for the execution of any task may be kept track of automatically with all YeS EVM. Since

$$T_{pr} = \frac{mn}{P_k}, \qquad (2)$$

where m - number of characters input into a computer (or, more accurately, into its working storage), the total actual processor time objectively reflects the amount of useful work actually done and automatically takes into account both the volume of input data and the complexity of the task. Processor time calculated in accordance with formula (2) reflects the amount of useful work with the condition that a given task be objectively necessary for the execution of an operational task or program debugging and that it yield a positive result. Processor time required for the re-execution of individual tasks through the fault of the VTs itself--equipment malfunctions, operator error and so forth--should be subtracted from total processor operation time in calculating average daily processor time.

It is advisable to add the following new indicators to TsSU SSSR Form No. 1 - mechanized calculation: actual average hourly computer output; processor time (that required for the execution of tasks); job execution time.

8963
CSO: 1870

SODIUM CHLORIDE CRYSTALS USED FOR INFORMATION STORAGE

Vil'nyus SOVETSKAYA LITVA in Russian 8 May 79 p 1

[Article]

[Text] Scientists at the Latvian SSR Academy of Sciences' Physics Institute have developed a method for entering information in sodium chloride crystals. The information is registered and reproduced with the help of a laser beam. Experiments have shown that hundreds of billions of information units can be stored in 1 cubic centimeter of sodium chloride. These units can constitute an extensive library consisting of tens of thousands of volumes.

11746
CSO: 1863

THE "SEZAM" ADAPTER

Riga SOVETSKAYA LATVIYA in Russian 9 May 79 p 4

[Article]

[Text] A new device developed by Belorussian scientists gives access to the incalculable treasures of information imprinted in a computer's memory to anyone, including those who do not know even the rudiments of programming. Together with a phonemophone device, the "Sezam" adapter that they have built makes it possible to communicate with any class of machine by means of the human voice, which is translated into an intelligible computer code and vice versa.

11746
CSO: 1863

APPEARANCE OF NEW PROCESS REGULATOR NOTED

Moscow PRAVDA in Russian 13 May 79 p 2

[Article]

[Text] How to automate a scientific experiment? Today, this question is troubling researchers in many countries. A unique answer to it was given by scientists from Moscow and production workers from the Tochelektropribor [Precision Electrical Instrument Plant] association in Kiev, who have started series production of an original innovation. It is called the "IVK-1" (computing and information complex, first model). The complex, which includes a small computer, can maintain or change the course of one process or another and even control it in an automated mode.

11746
CSO: 1862

USSR

HAND CALCULATORS ELEKTRONIKA BZ-21 AND ELEKTRONIKA SZ-33

Moscow NOVYYE TOVARY in Russian No 6, 1979 p 14

[Article]

[Text] The Elektronika BZ-21 is the first Soviet programmable hand calculator designed for engineering, scientific and statistical work. Incorporating the latest achievements in electronic technology, it is based on four large-scale integrated circuits (BIS). The hand calculator operates on eight-place decimal numbers. Results are read from a twelve digit display. Numbers ranging from $\pm 10^{-99}$ to $\pm 9.999999 \cdot 10^{99}$ can be represented. Numbers which do not exceed eight decimal places are represented in fixed-point decimal form. Numbers which exceed eight decimal places are represented in floating-point form. Number of executable operations: 29. Number of addressable memory registers: 7. Number of stack memory registers: 6. Number of program steps: 60. Required power: 1 watt. Average execution time for arithmetic operations and for the functions $1/X$, X, X^2 is 0.5 sec; for functions X^Y it is 9 sec; for natural logarithms - 5 sec.


электроника Б3-21
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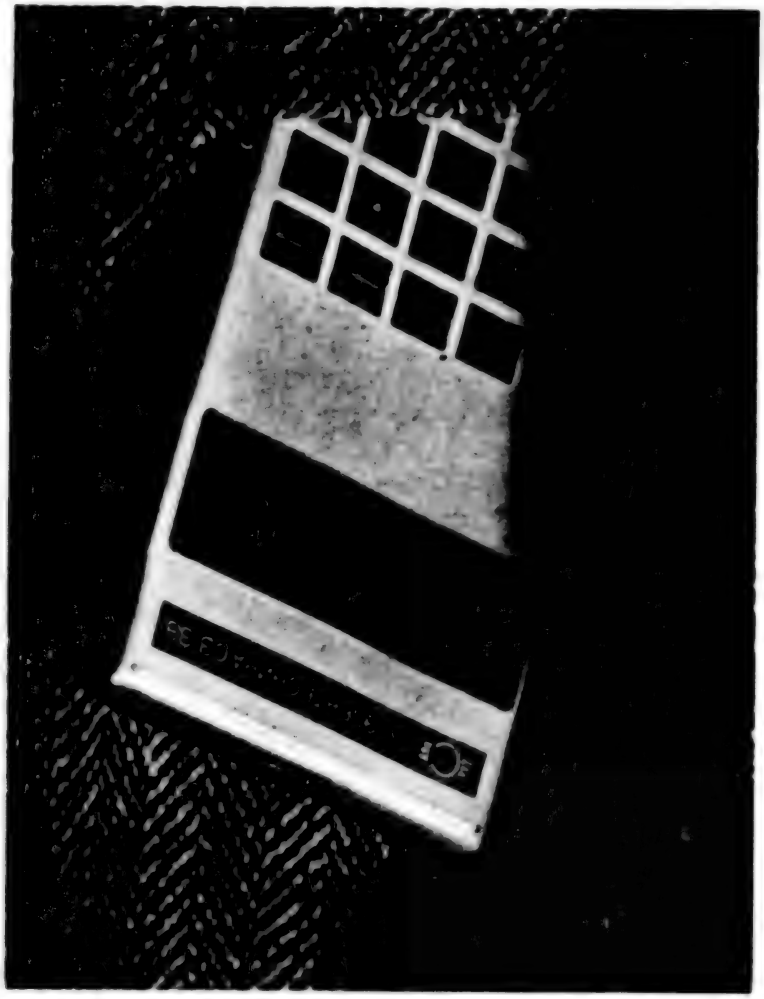
The hand calculator works off either its own direct current source--four D-055S batteries (two hours of continuous operation) or its BP2-3 power pack, which is connected to the 220V, 50Hz alternating current system (around-the-clock operation). The calculator provides for blocked input: if an eight-digit mantissa has been entered, then pushing additional digit keys will have no effect on the display. The calculator keyboard and case are made of varicolored plastic. Some keys combine two or three symbols. Dimensions: 185 X 100 X 42 mm. Weight: 0.39 kg. Price: 350 rubles.

The other hand calculator, Elektronika SZ-33, is designed for everyday use and for commercial, scientific and instructional applications. It operates with eight-digit positive and negative decimal numbers in fixed-point form. Information is entered via the keyboard. The calculator performs addition, subtraction, multiplication, division, percent calculation, inversion, data accumulation and storage in memory, sign change, substitution of working registers' contents and calculation with a constant. Correction of wrong function and number entries is possible. Execution time of a single operation: 1 sec.



Power is supplied from a set of four D-0.1 batteries connected in series or from a BP2-3 power pack connected to the regular 220V, 50Hz electrical system. Required power: 0.35 watts.

The keyboard and case are made of colored plastic. Dimensions: 130 X 70 X 12 mm. Weight: 0.2kg. Price: 60 rubles.

The hand calculator Elektronika BZ-21 was created at the Kristall Industrial Association in Kiev, while the Elektronika SZ-33 was created at the Svetlana Electronic Instrument-Making Association in Leningrad.

CSO: 1863-P

USSR

PARTY AND SCIENTIFIC LEADERS ATTEND EXHIBIT OF NEW RYADS AND MINICOMPUTERS

Moscow IZVESTIYA in Russian 13 Jul 79 p 1

[Article: "Attendance at the Exhibit"]

[Excerpts] A successful international exhibit entitled "Resources of the Unified System of Electronic Computers and the System of Minicomputers and Their Application" is being held at the VDNKh USSR [Exhibition of Achievements of the National Economy USSR].

The exhibit has been visited by Comrades A. P. Kirilenko, A. N. Kosygin, N. A. Tikhonov, V. I. Dolgikh, M. V. Zimyanin, and K. V. Rusakov, as well as by deputy chairmen of the USSR Council of Ministers N. K. Baybakov, K. F. Katushev, V. A. Kirillin, and L. V. Smirnov. A. P. Aleksandrov, president of the USSR Academy of Sciences, also visited the exhibit.

CSO: 1863-P

USSR UDC 621.3.013.8:65.011.56.001.4

A SYSTEM BASED ON A CONTROL MICROCOMPUTER FOR AUTOMATICALLY REGULATING THE EXCITATION OF A SYNCHRONOUS GENERATOR

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 79 pp 6-9 manuscript received 29 Dec 78

LYUBARSKIY, V. G., candidate in technical sciences; FADEYEV, A. V., LOTKOV, M. A., SAFONOV, N. T., PURE, R. R., KRAMFUS, I. R., and SMIRNITSKIY, M. A., engineers

[Abstract] A system for automatically regulating the excitation of large synchronous generators has been developed which uses a control microcomputer making it capable of self-adapting to continuously varying operating conditions in a power plant. This is in addition to conventional response to voltage and frequency deviations and regulation on the basis of rates of change of the armature voltage and current, for both static and dynamic stability. This is made possible by evaluating the operating conditions at any time and tracking the available reactive power. The system operates on the principle of direct digital control. It includes a microcomputer with a series K580 microprocessor, receiving data from the three generator phases and from the inverter-exciter. This microcomputer also contains an analog input/output device with an encoder and an arithmetic expander. Its main storage connects to an upper-level computer through a timer and a sequential interface, its read-only memory connects to a control panel and to 2-position signal transmitters through a chopping controller and a parallel interface. The system is furnished with software for operation in real time. The programs are grouped appropriately and all algorithms have been checked out experimentally. Figures 3; references 4: 1 Russian, 3 Western.

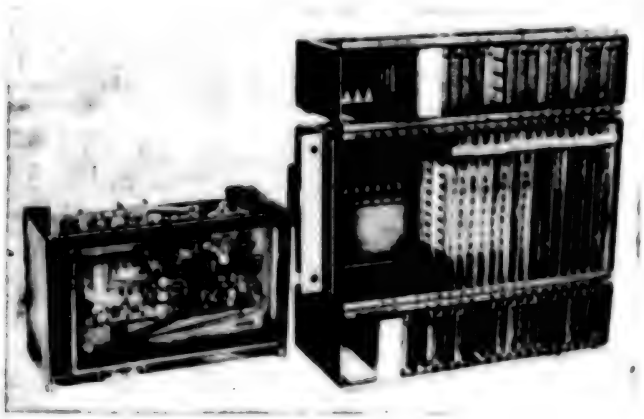
USSR UDC 62-529.001.3

GENERAL-PURPOSE DEVICES WITH PROGRAMMED LOGIC

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 79 pp 20-21 manuscript received 27 Oct 78

KRUPKO, A. S., AL'TSHULER, M. I., and GORCHAKOV, V. V., engineers

[Abstract] Programmed logic operating with a microprocessor makes feasible large series production of general-purpose devices for a wide range of applications. At VNIIR (possibly All-Union Scientific-Research Institute of Relay Construction) there has been developed such a general-purpose UPL-type device with programmable logic fo control of heavy-duty and special-purpose metal cutting machine tools. It is essentially an electronic control machine built on the basis of microelectronic integration to perform operations according to programs stored in the read-only memory. These programs are written to accommodate any particular control algorithm for a given mechanism. It operates on the principle of interrogation and instruction, a system of elementary commands making it possible to describe any relay sequence. It can operate with binary, binary-decimal, adding, subtracting, and reversible counters. It consists of at least 3 and at most 13 cells (1-4 input cells with maximum 256 inputs each or 16 per board, 1-8 output cells with maximum 128 outputs each or 8 per board, and 1 control cell). The main storage has a maximum capacity of 4 kbits or 1 kbit per board; the read-only memory has a capacity of 8192 bits. Programs are recorded either manually or automatically; in the latter case first on a 7-track punch tape from which they are read out. A special inspection panel is available for checking and adjusting manufactured ULP devices to individual customer's specifications. Figures 1; tables 1.



LASER-ASSISTED PERIPHERAL UNITS USED IN CZECH TRADE ORGANIZATIONS

Moscow PRAVDA in Russian ("The Laser Serves Trade") 18 Jun 79 p 5

[Abstract] There are now more than 70 electronic computers in use in Czechoslovakia's domestic trade organizations.

New peripheral devices which use lasers to help process information have given a good account of themselves in trade organizations in the cities of Brno and Chrudim. These units eliminate the need to prepare data for input to the computer; instead, they "read" the text and write it directly onto magnetic tape.

CSO: 1863

F. Programming and Software

Translations of Articles

NEW COMPUTER ALGORITHMS AND PROGRAMS IN THE CONSTRUCTION SECTOR

Moscow NA STROYKAKH ROSSII in Russian No 4, 1979 pp 40-41

[Unattributed article]

[Text] New computer algorithms and programs in the "Construction" sector have come into the sector and information fund of TsNIPIASS [Central Scientific-Research and Planning-Experimental Institute of Systems Automation and Construction] of Gosstroy of the USSR.

The ROS' System

The ROS' system includes three subsystems: ANAKOND, KORIDA and AUTOPES.

The ANAKOND subsystem is designed to store and correct the normative base on magnetic tapes. Normative data entered from punched carriers are converted to the internal formats of the computer and are stored on magnetic tapes in the NORMA file. These files are subsequently used by the estimates accounting and delivery subsystem.

The ANAKOND subsystem operates with two magnetic tapes. The first is an input tape which contains the initial NORMA normative file subject to correction. The initial estimates are punched on punch cards or punch tapes for correction or storage according to the specific mission.

The KORIDA subsystem is designed to store and correct the input data archives on magnetic tape. The subsystem enters the input data from punched carriers, translates terms of the input language, translates and calculates formulas and performs diagnostic monitoring of data. The input data are converted to the internal formats of the computer and are stored on magnetic tapes in the input data archive, called the archive file.

The input data files stored in the archive are subsequently utilized by the estimates accounting and delivery subsystem. The total number of files in the archive should not exceed 256 and the number of positions inside the file should not exceed 10,000, including titles, headings of parts and sections and notes.

The AUTOPES subsystem is designed to select estimates from the estimates archive (AS), to formulate a packet of estimates, t fuse the input information (from estimate items) with normative data and to calculate the costs and to issue estimate documentation on form No. 3. The input information for the subsystem is the input data from the AS on magnetic tape and the normative data from the normative base on magnetic tape. The subsystem makes it possible to carry out simultaneous processing of the estimate packet, containing up to 10,000 items. The packet may include up to 20 estimates related to different construction objects.

The system was developed on ASSEMBLER for the YeS EVM [Unified Computer System] and can be used on any model of the YeS series, beginning with the YeS-1020, equipped with DOS YeS [Disk Operating System of the YeS] and having an internal storage capacity of 64 Kbytes.

The system has been introduced at Donetsk Promstroyniiproyekt [expansion unknown], Soyuzvodokanalproyekt [expansion unknown], the Irkutsk Promstroyproyekt [expansion unknown], Soyuzkurortproyekt [expansion unknown], the Crimean Branch of Ukrgiprovodkhoz [Ukrainian State Institute for the Planning of Water Management Structures and Rural Electric Power Plants] and other organizations.

The ROS' system was developed at GPI-5 [State Planning Institute] of Minlegprom [Ministry of Light Industry] of the USSR (Kiev) and has been included in the sector fund of algorithms and programs (Nos. II-27, II-28, II-29, II-30 and II-31).

One can become familiar with the rules for using the algorithms and programs included in the fund at the address: 117393, Moscow GSP-312, Novyye Cheremushki, kvartal 28, korpus 3, TsNIPIASS. The telephone number is 128-97-01 and the teletype number is 111850.

The RITM Program

The program for planning the stock in contracting organizations (RITM) is designed to plan the stock in contracting construction-installation trusts which carry out various types of industrial and related construction. It may also be used in other construction-installations organizations with sufficiently large work program.

Stock planning is carried out on the basis of state stock norms (SN 384-75 and SN 104-75) and by objects not encompassed by the norms with regard to the required readiness, according to calendar (network) schedules within the POS [expansion unknown] and PPR [expansion unknown]. The stock planned in this manner will satisfy the conditions of construction of objects within the deadlines provided by the norm or achieved by calculation.

The stock should be calculated on the basis of 5-year operating plans of the contracting organizations under conditions of 2-year planning, that is, during the preplanning year with regard to the beginning of construction

during the preceding year (the first planning year) and putting into operation during the next (second planning year) or, depending on the length of construction of objects, during subsequent years. In this case the first planning year will be the main one and the subsequent years will be the calculating years.

To solve the problem, the objects planned for construction must first be distributed in time so as to achieve the maximum loading of the contracting organization's capacities and so that rhythmic introduction of objects into operation is provided within given limits. The "schedule" of construction of objects is compiled on the basis of the formed production program -- the beginning of construction during the first planning year is determined, but so as to provide uniform loading of the contracting organization's capacities and rhythmic introduction of objects during the second planning year.

The input data are:

Permissible deviation by the rhythm of putting into operation;

The initial (input) plan of construction of objects executed voluntarily;

The capacity of the contracting organizations by months of the year;

The capacity of the contracting organization required to complete transient objects by the months of the year.

The input data are recorded on a form from which it is punched. The number of newly begun objects should not exceed 30. The dimensions of the stock are calculated both for an individual object and for the organization as a whole.

The program was written in PL-1 language for the YeS EVM and can be used on machines with main storage capacity of not less than 128 Kbytes with standard input-output devices.

The program was developed at the Moscow Institute of Control imeni S. Ordzhonikidze and has been included in the sector fund of algorithms and programs (No. III-84).

6521
CSO: 1870

G. Automated Design and Engineering

Translations of Articles

PROGRAMS FOR CALCULATION OF STEEL STRUCTURES

Moscow NA STROYKAKH ROSSII in Russian No 4, 1979 pp 42-43

[Article by F. Ponomarev, chief specialist of TsNIIproyektstal'konstruktsiya (Control Scientific-Research And Planning Institute of Structural Metal Design and Construction)]

[Text] The ever increasing volumes of construction and the use of new design solutions have confronted designers with the problem of reducing the design deadlines and the estimated cost of structures.

Thus, calculation of masts on guy wires for the effect of arbitrary combinations of static and dynamic components of external loads is a rather cumbersome problem. The presently existing method of calculation no longer meets the ever increasing needs placed on this operation.

A complex of computer programs has been developed at TsNIIproyektstal'konstruktsiya which permits automation of all steps of calculating masts using guy wires. It includes programs for static calculation, dynamic calculation, checking the masts for stability, checking the cross-sections of the mast column, formation and issue of the loading diagrams, input-output programs and service programs.

Written in the input language of the TA-IM translator for type M-20 computers, they are autonomously translated and formulated in the form of standard TA-IM BSP programs. The external block of the complex performs the functions of a compiling and control program.

The developed system makes it possible to calculate masts using guy wires [illegible] the number of spans up to 11, the total number of guy wires up to 100 [illegible] the total number of points of application of concentrated force factors on the mast column up to 100.

The geometric and static characteristics of the guy wires of one level can be different.

The time of calculating a single mast with the maximum permissible number of parameters does not exceed 20 minutes on the BESM-4 computer.

The results of calculation are printed on the ATsPU [Automatic digital printing device] with a sufficient number of commentaries and does not require further decoding.

The use of the program complex reduces the design deadlines by a factor of 3-5 and permits a reduction of the estimated cost of the structure due to extensive use of variant design.

Experimental operation of the complex was carried out at TsNIIproyektstal'konstruktsiya and GSPI [State All-Union Planning Institute] of the Ministry of Communications of the USSR.

An economic effect of 200,000 rubles was achieved as a result of using automated calculation during design of radio relay masts during a single year alone due to reducing the estimated cost of the structures.

The use of the complex in design of a typical television mast 250 m high at TsNIIproyektstal'konstruktsiya made it possible to reduce its estimated cost by 15 percent compared to similar masts designed previously.

A program which automates the design of steel crane jibs using the Minsk-22 computer was developed at the Ukrproyektstal'konstrukstiya Institute [expansion unknown]. The main laborious steps of design--static calculation for crane loads, optimization of the parameters of cross-sections and structures and formulation of the jib description during the stage of working drawings--were automated and combined into a complex.

The jib parameters were optimized within the design forms of mass use: welded I-beam jibs of constant height, with booms of identical width, wall reinforcement by transverse stiffening ribs arranged with constant spacing and if this is suitable with a longitudinal stiffening rib in the compressed zone of the wall. The overall stability of the booms is provided by a stopway and auxiliary structures.

The variable parameters--the height of the jib, the wall thickness, the width and thickness of the booms, the system of stiffening ribs and the diagram of cross-section variation--are optimized on a discrete set of variables determined by the grades of rolled sheet steel and the conditions of its delivery. The cost determined by professor Ya. Likhtarnikov's method with regard to the actual indices of the laboriousness of manufacture is used as the criterion.

The optimum parameters of the crane jibs of minimum cost were investigated using the program and some new recommendations on their design were found.

After an experimental check, the program was included in the sector stock of algorithms and programs and was published by TsNIPIASS [Central Scientific Research and Planning-Experimental Institute of Systems Automation and Construction] by numbers I-126 and I-127.

The program is used by many planning organizations of Gosstroy of the USSR and other agencies in design of one-storey industrial buildings and crane platforms and developments of new standard series of steel crane jibs.

Automated design of steel crane jibs compared to the ordinary method yields an approximate 10 percent decrease of materials consumption and cost of these structures. The economic effect in the output of 200,000 crane jibs comprises 1.5 million rubles annually.

Development and improvement of the design forms of assembled steel sections leads in many cases to systems which have cyclic symmetry. These systems are multielement and their calculation is rather complex. The approximate calculating methods now used, even when using computers, lead to making the designed structures heavier and more expensive. The existing programs for calculating structures do not take into account the properties of cyclic symmetry and, therefore, are either incapable of solving the problem or lead to an increase of the deadlines and cost of design.

All the mentioned deficiencies are eliminated with automation of calculations of complex three-dimensional cyclically symmetrically structures.

The system of algorithms and programs for the Minsk-22 computer is designed for static calculation of three-dimensional structures whose calculating diagram has cyclic symmetry and may be represented in the form of a set of rods and finite elements.

Automation of calculations is applicable to many types of structures with cyclic symmetry. Among them are the frameworks of cooling towers of different shape, domes for large-span roofs, the supporting structures of radio telescope mirror antennas and radio broadcast and television towers.

Calculations of three-dimensional structures not having properties of symmetry are also automated. The basis of the algorithms is the method of displacements which utilizes the properties of cyclic symmetry which permits a sharp reduction of the required computer storage capacity and the problem-solving time by spectral expansion of the matrix of the system of equations and use of complex transformation of main unknowns.

The use of special methods of calculation made it possible to achieve quantitative indicators on a medium-capacity computer: the number of sectors in a cyclically symmetrical system may reach 99, the number of unknown methods of displacements in a single sector may reach 1,420 (in this case the total number of unknowns in all the sectors numbers in the tens of thousands) and the number of rods and elastic elements may reach several thousand in a single sector.

All the programs were produced by translation from ALGAMS language using the MEI-3 translator. The total number of individual programs (blocks) is 48 and the number of machine instructions is approximately 100,000. The system is supplied with self-servicing devices (monitoring, duplication, packing and so on) and external service devices.

The mobile layout of the system makes it possible to improve or replace individual blocks without disrupting the functioning of the system as a whole, to supplement the program system for new types of rods and finite elements and to compile specialized subsystems from the blocks of the system for special types of structures.

Logical control of input data, automated management of the work protocol and recording the intermediate steps of calculations, issuing of lists on the state of the calculating process, the possibility of changing the order of calculations and of operative interference during the course of work and the capability of stopping the process and of restoring it after the interruption are provided during problem-solving.

The results of the calculations are automatically formulated in the form of an album, which contains a title, explanatory note and data on the loads on the system, displacement of systems subassemblies and the stresses in the elements.

The level of calculating processing of designs is increased by introduction of calculation automation, the design deadlines are reduced by a factor of 2-3 and the cost of the construction objects is reduced by 5-10 percent.

Experimental operation of the system is being carried out at TsNIIproyektstal'konstruktsiya, GPI, Ukrproyektstal'konstrukstiya and the Leningrad Promstroyproyekt.

6521
CSO: 1870

USSR

FORMULAS FOR INSTRUMENTS OF THE FUTURE

Leningrad LENINGRADSKAYA PRAVDA in Russian 6 Apr 79 p 1

[Article by N. Krupenik, Tonkoy]

[Text] Henceforth a fast computer will be capable of taking over the responsibilities of designers of extra-precision instrument probes, guided by a mathematical model which has been constructed by scientists at the Leningrad Polytechnic Institute imeni M. I. Kalinin.

Yesterday specialists at this higher educational institution have completed experimental checking of the design-by-computer method.

Prof E. M. Shmakov, who heads the team of scientists, commented on this news item: "To realize the timeliness of the research done here, suffice is it to note that there still are no theoretical basics available for more than half of all measuring instruments now produced. Not knowing the minute physical processes, specialists must often extract the necessary information by so-called inspiration. This is why the proposed mathematical programs will serve as a reliable aid in the construction of fundamentally new measuring devices."

"It is important," the scientist concluded, "that the automated design system eliminate the blueprint drawing stage from the design process, by issuing the manufacturing specifications for instrument parts directly to the machine tool through digital control."

2415
CSO: 1863

THE COMPUTER DESIGNS

Moscow VOZDUSHNYY TRANSPORT in Russian 4 May 79 p 3

[Article by V. Gatash, TASS correspondent, Khar'kov: title as above]

[Text] A computer has become an assistant design engineer for electronic equipment. Scientists at the Khar'kov Institute of Radio Electronics have developed a method for using a computer to design the printed-circuit cards that serve as the basis for modern radio equipment, computer hardware, and communications facilities.

"The machine is given only the initial data for the plan," says Professor V. Frolov, head of the Department of Computer Design. "It then sets forth the spatial arrangement of the numerous elements, connects them in the manner needed, and prints out the finished plan on punched tape, in the form of programs for automatic machine tools.

11746
CSO: 1863

EMPLOYMENT OF COMPUTERS IN PLANNING AND DESIGN WORK DISCUSSED

Moscow BYULLETEN' STROITEL'NOY TEKHNIKI No 5, 1979 pp 38-40

[Article by D. R. Prokhorov, deputy head of Glavpromstroyproyekt (Main Administration for Construction and Planning of Industrial Enterprises) of Gosstroy USSR: "In Scientific Research and Planning Institutes, Utilizing Computers in Planning and Design Work"]

[Text] The planning organizations of Glavpromstroyproyekt of Gosstroy SSSR [State Committee on Construction of the Council of Ministers of the USSR], which primarily execute the construction-related portion of plans for industrial enterprises and other structures, employ computers on a widespread basis in their work. The technical base of Main Administration institutes required for automating planning and design operations is being continuously developed and improved. While computer resources per designer ran to 13 operations/s in 1975, they totaled 43 operations/s per designer as early as the beginning of 1979.

Within Glavpromstroyproyekt organizations there are now 26 medium-capacity computers, of which 9 are YeS EVM [unified computer systems], and 32 low-capacity computers (of the Nairi, Mir and Promin' varieties). In 1978 there began to appear the minicomputers of the SM EVM [system of small computers]

variety, the M-7000 and the M-6000. These machines may be employed both independently and in combination with medium-capacity YeS [unified system] series computers.

The cost of the operations performed by subunits for the automation of planning and design operations and the mechanization of engineering calculations totaled more than 5.5 million rubles in 1978, which includes more than 5 million rubles for internal requirements.

Institutes have done and currently have under way a deal of work in the area of algorithm and program development, as well as in assimilating programs developed by other organizations. The primary results achieved up to the present time by Main Administration organizations in the area of automating the planning and design process may be combined into the following groups: the automation of engineering calculations: the optimization of planning decisions; the automation of calculation estimates; automating the development of planning solutions; and the integrated automation of the planning and design process.

The first group of operations includes the programs KARFA (developer--the Khar'kov Promstroyniiproyekt [expansion unknown] and RASK-M (developed--TsNIIprovektstal'konstruktsiya [Central Scientific-Research and Planning Institute of Structural Metal Design and Construction]) for designing systems of reinforcing rods for static and dynamic loads, calculating mathematical combinations of forces within structural elements and in the selection of cross sections for elements and optimizing-element reinforcement in accordance with the computer-generated solution. Programs of this type are used the most frequently and are resulting in substantial economic gain by reducing the consumption of materials for basic supporting structural elements by an average of 3 to 5 percent, as well as by increasing the productivity of the labor of planning and design personnel and accelerating the planning and design process.

We may include in the second group the AVRORA program developed by the Leningrad Promstroyproyekt for optimizing the distribution of rigidities within the plane frame of a structural framework and for planning and designing the elements of structural frameworks and foundations with elements of optimization from design solutions.

Computation estimates are being executed in substantial volumes on the Minsk-22 computer using the AVS program developed by the Kazakh Promstroyniiproyekt and on an EVM YeS [unified system computer] using programs developed by other organizations. Programs of this type are making it possible appreciably to increase the productivity of the work of those involved in the process of working out estimates and to shorten the time required to produce these estimates. All estimates put out by the Kazakh Promstroyniiproyekt are performed by computer, as are 82 percent of those by Promstroyproyekt, 80 percent of those by the Leningrad Vodokanalproyekt [possibly State Planning Institute for the Surveying and Planning of Outdoor Water Supply, Sewer Systems and Hydraulic Engineering Structures], 75 percent of those by the Irkutsk Promstroyproyekt and Planning Institute No. 2 and so forth.

Among the developments utilized in generating planning and design solutions we may include the "System-1-76" program system developed by TsNIIPIAS [expansion unknown], Design Institute-1 and other Glavpromstroyproyekt institutes. With this system we can produce erection and assembly schemes for the structural element of single-story industrial facilities designed with standard reinforced concrete elements, element specifications, data related to materials selection and other information. In addition to shortening the time required for the execution of operations, systems of this type employed in structural planning and design make possible a more precise selection of the type of structural element required and substantial economies in the use of concrete and reinforcing steel. It should be pointed out that these program systems do not as yet permit the output of summary planning and design documentation--the working plans which would be used directly by construction organizations.

In 1977, the tower planning and design production flow line (TLP-tower) went into operation, a system developed by TsNIIproyektstal'konstruktsiya in which the entire process of planning and designing steel structural elements for independently standing support towers for communications facilities using standard, unitized elements has been automated on an integrated basis. A result of its operations has been the full development of the KM [expansion unknown] design. This system makes possible a reduction of up to 10 percent in the consumption of steel and a two-to three-fold decrease in the time required for the development of a single tower design (plans of the KM type). The productive efficiency of the TLP-tower allows a team of 5 designers to turn out 15-20 sets of plans a year.

Glavpromproyekt organizations now have further work under way in the area of automating planning and design operations with development in the following directions:

The development of institute systems of automated planning and design (SAPR-PI);

Participation in the development of application software packages (PPP) and planning and design production flow lines (TLP) within the framework of a coordinated plan;

Local and specialized institutional development of annual target-subject plans for budgeted planning and scientific-research operations.

Operations costing a total of approximately 1.5 million rubles a year are under way on developments in all these areas connected with the application of computer technology to planning, design and research.

The SAPR-PI represents the highest form of automation, which should insure the achievement of the greatest economic gain. These systems are being developed for two general construction institutes, the Leningrad Promstroyproyekt and Goskhimproyekt [State All-Union Institute for the Planning of

Special Structures, Buildings and Sanitary-Engineering and Power Installations for Chemical-Industry Facilities], and one specialized institute, TsNIIproyektstal'konstruktsiya.

The items developed by Glavpromstroyproyekt organizations in the process of creating the SAPR are, with respect to the software involved, methodological, program-oriented, informational, technical or organizational in nature.

Twenty Glavpromstroyproyekt institutes are participating in the development of the planning and design production flow lines (TLP) and the applied program packages (PPP). The TLP and PPP have been designed to automate substantial volumes of planning and design operations. The most important of this type are the PPP for performing strength calculations for structures and structural elements and for determining the configuration of facilities under construction and the production flow lines for the planning and design of frameworks for industrial facilities, standard reinforced concrete structural elements and so on. These developments should yield a significant economic gain as a result of the broad area over which they may be utilized. They are also being utilized in the SAPR-PI being developed.

A number of Main Administration institutes, specialized institutes for the most part, are working on automating the process of solving special local planning and design problems. Work is also under way on the development and improvement of specific programs and program systems designed for EVM YeS. The most effective programs are being incorporated from among those in the collection of algorithms, programs and other newly developed software belonging to institutes of Gosstroy USSR as well as to individual ministries and departments.

In the process of preparing instructional method materials a great deal of attention has been devoted to a presentation of current norms and rules in accordance with the capabilities of computer data output equipment. Thus in 1977, SN [construction norms] 460-74 were approved which specify the requirements concerning the content and preparation of plans and drawings. Norm provisions allow for the possibility of formulating technical steel specifications both manually and with the use of the computer.

In the process of developing SAPR program components an orientation has been assumed in the direction of utilizing a single algorithmic language (high level PL-1) and operational system OS YeS EVM [operational system for unified computer system]. A great deal of work is under way on the development of a SAPR data management system. This system will not only systematize and standardize information with respect to the form of its presentation, but also record it for machine mediums. Involved in this effort have been specialists of automation sections, engineering calculation mechanization sections and institute planning and design departments.

The standardization of planning and design organization hardware (a changeover to YeS EVM) will make it possible to accelerate the development of SAPR software and intensity the process of introducing programs.

Improvements are also being made in the software for the office equipment required for SAPR operations designed for duplicating, storing and retrieving microfilmed documentation.

Main Administration planning and design institutes have accomplished much in the area of developing SAPR executive software. The Leningrad Promstroyproyekt and Goskhimproyekt, for example, have developed models of a planning and design process advancing in discontinuous stages over time, during the course of which there occurs interaction and cooperation between general construction and planning and design production organizations and the planning and design subdivisions of general construction organizations.

TSNIIproyektstal'konstruktsiya utilizes the technology worked out here for processing the tasks developed on the part of the planning and design sections in the institute's computer center. The Leningrad Promstroyproyekt, Goskhimproyekt and TsNIIproyektstal'konstruktsiya have developed and are putting into effect documents governing the composition and content of operations in their various stages, as well as the content and format of SAPR summary documentation.

The first phases of the planning and design institute's SAPR, the planning and design production lines and the packages of application software are already making it possible to achieve a substantial economic gain. According to engineering plan data, the productivity of labor within institutes in which the first phase of the SAPR-PI will be introduced will increase by approximately 15-20 percent. By optimizing planning and design decisions and reducing the consumption of materials, there is anticipated in this connection an annual saving of construction resources totaling 10 million rubles. If we consider that a variety of the resources which have been developed comprised of the production lines and application program packages will be utilized in other planning and design organizations as well, the total economic gain will prove to be substantially greater.

At the beginning of 1978, on the basis of a study of the status of computer use in organizations within its jurisdiction, Glavpromstroyproyekt developed and approved within Gosstroy USSR a comprehensive, integrated long-range plan covering the period until 1985 and dealing with the introduction of automated systems and computer technology; it provides for a further expansion of the work being done on SAPR and the introduction on a more widespread basis of SAPR-PI, TLP and PPP within Main Administration organizations.

8963
CSO: 1870

II. ECONOMIC APPLICATIONS

A. General Treatment

Translations of Articles

SYSTEMS AND METHODS OF MANAGEMENT

Novisibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 3, 79 pp 59-62

[Article by V. Ya. Myasnikov, dr in technical sciences, professor, Chief of the Main Administration of Computer Techniques and Management Systems of the State Committee of the Council of Ministers, USSR, on Science and Technology (GKNT); and V. V. Boyko, candidate in physio-mathematical sciences, Department chief of the Main Administration of Computer Techniques and Systems of the GKNT (Moscow)]

[Excerpts] Electronic Computers

Computers are the most complex kinds of products. Specifications for computers contain a great number of parameters, the basic ones being productivity, and the number of calculated operations (instructions) per second. Although the "operations per second" are a good reflection of the technical standard of each computer, it is still insufficient for evaluating the true possibilities of one or another set of computers with peripheral devices. It is well known that in practice the true productivity of a computer complex depends on speed of operation and the number of input-output devices, memory on tapes and magnetic discs etc. The "operations per second" indicator has all the basic shortcomings of a typical gross indicator while the manufacturer is only interested in producing processors with a minimal set of peripheral devices.

Therefore, developing a computer efficiency indicator that takes into account other properties of the complex is urgent primarily for planning computer production. In view of the complexity of the evaluation of computers, this indicator, apparently, will be found to be fairly complex. It is necessary, for example, to take into account the full operating time, the life of the computer complex, the possibility of input and output of graphic data, the organization of a dialogue mode of operation and other consumer properties

of a given computer. It is also useful to characterize the possibility of standard software being supplied with the machine -- in short, it is necessary to take into account a great number of factors important to the user.

We will show that even the simplest version of such a comprehensive indicator takes into consideration more user properties of computers than "operations per second."

The productivity of a computer complex as a channel for processing data is limited, first of all, by the productivity of the printing devices. The volume of the working memory also plays an important role. Therefore, we can evaluate the usefulness of a computer by the expression:

$$A = \frac{O.V}{U.Ts} \qquad (14)$$

where O -- volume of working memory in kilobytes;

V -- productivity of output printing devices in symbols/sec;

U -- time of multiplying the fixed point number in m/sec (this value is equivalent to the productivity of the computer in instructions/sec);

Ts -- cost of a basic computer set.

Thus, in formula (14) such "output" indicators as the productivity of the processor and printing devices, as well as the volume of the working memory are given in terms of expenditures (cost) which is an "input" value. Of course, various versions of this formula can be proposed that take into account more fully the productivity, reliability, life and other properties of the computer.

Nevertheless, even in such a relatively simple version, formula (14) "works" well when comparing basic sets of various computer types. Table 2 shows calculations of the usefulness and quality for medium and large computers of the third generation compared to the M-4030 machine. As we see, the computer quality determined by the cited formula depends considerably not only on the productivity of the processor, but also on the productivity of the printing devices and the total cost of the computer complex. For example, the YeS-1022 machine has a fairly low quality due primarily to low speed of the processor and printing devices, as well as the comparatively high cost of the basic set. The YeS-1040 machine with good technical characteristics loses out in quality due to its high cost. Of the medium-size machines, the best appears to be the YeS-1033 basic set.

Conventional Sets

The analysis of the quality of such complex products as computers leads us to the possibility of comparing not only various models of similar products, but also various sets (configurations) of the same product. This is especially useful when the sets are complicated and the manufacturer is not interested in providing additional devices and spare parts for them. Thus, this occurs, in particular, also in the production of computers inasmuch as the basic cost and the basic "operations per second" indicators apply to the processor part of the computer. With the existing plan indicators, plants are not interested in supplying peripheral devices since they are expensive to manufacture and the share of the costs of such devices in the total cost of the set is insignificant.

Table 2

(1) Показатель	(2) Размерность показателя	(3) М-4030	(4) ЕС-1022	ЕС-1060	ЕС-1061
(5) Время умножения	мксек (11)	20	80	8	2
(6) Оперативная память	кбайты (12)	128	128	256	256
(7) Производительность печатающих устройств	знаки/сек (13)	2350	1700	3500	4700
(8) Цена	тыс. руб (14)	410	400	2300	2500
(9) Полезность	(15) $\frac{\text{биты} \cdot \text{знаки} \cdot 10^7}{\text{сек}^2 \cdot \text{руб}}$	3.67	0.68	5.07	24.9
(10) Качество	(16) Относительно М-4030	1,00	0,19	1,38	6,80

1. Indicator
2. Indicator dimension
3. M-4030
4. YeS-1022
5. Multiplying time
6. Working memory
7. Productivity of printing devices
8. Cost
9. Usefulness
10. Quality
11. Millisec
12. Kbytes
13. Symbols/sec
14. 1000 rubles
15. $\frac{\text{bytes} \cdot \text{symbols} \cdot 10^7}{\text{sec}^2 \cdot \text{rubles}}$
16. Relative to M-4030

We will now take a look at how the computer efficiency and quality appear if one additional output printing device is added to the basic set. It may be seen immediately from the structure of formula (14) that the numerator of the fraction increases considerably more than the denominator since the total cost of the set increased insignificantly. Corresponding calculations of K with respect to the basic set of the M-4030 machine are shown in Table 3. As we can see, the addition of one printing device to the basic set of the computer increases its quality considerably since, in formula (14), the total speed of operation of the output printing devices is especially taken into account.

Table 3

	M-4030	YeS-1022	YeS-1033	YeS-1040	YeS-1060
K	1.73	0.34	3.52	1.95	9.85

"Sensitivity" of indicator K to the change in values which enter into it is useful for planning the production of computers (and other complex products) in "conventional sets." A production plan can be established, for an enterprise, in conventional units of these products in accordance with formula (6). Then the usefulness of the set, assumed as basic, is calculated. Any increase in the set above the basic one (for example, on demand by the customer) will improve its quality and will make it possible for the enterprise to account to planning organs by total accountable data, i.e., the number of "conventional sets" of products.

A mass production model with good technical and economic indicators, or a conventional reference model, corresponding to government standards, may become the basic set for central planning organs and industrial ministries.

The examples and calculation cited above are, of course, very simple. This was done especially to demonstrate the general approach to evaluating the usefulness and quality of the product. To be able to utilize these indicators in practice, detailed work is required in each concrete case in order to select the most informative technical-economic indicators which must characterize the usefulness and quality of a certain variety of products.

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CSO: 1863

Abstracts of Articles

USSR

ANNUAL RADIO DAY CELEBRATED

Moscow RADIO in Russian No 5, 1979, inside front cover

[Abstract] Every year the Soviet people celebrate May 7th as Radio Day. A great deal of progress has been achieved since the days of radio pioneer A. S. Popov, especially in the area of computer technology, which is a symbiosis of radio engineering, electronics, and mathematics.

1) In the photo at the upper left, engineer L. Serebryakova processes incoming information at the Computer Center of the Central Statistical Administration;

2) A topoligical circuit, enlarged several dozens of times, is shown in the photo at the upper right;

3) The Computer Center of the Siberian Department of the USSR Academy of Sciences, one of the largest in the Soviet Union, is associated with outstanding work in the field of applied mathematics. The photo in the center shows operators working with the BESM-6 computer;

4) Machine-aided design is illustrated in the photo on the bottom of the page. It was taken in the Minsk Scientific-Research Institute of Electronic Computers, where the joint efforts of Soviet and Bulgarian specialists were responsible for creating the YeS 1035 computer, which is used to design other computers.

CSO: 1863-P

B. Bloc Cooperation

Translations of Articles

BULGARIAN COMPUTER TRAINING CENTER DISCUSSED

Moscow TEKHNIKA I NAUKA in Russian No 5, 1979 pp 34, 42

[Article by G. Malinichev: "In an Atmosphere of Friendship"]

[Text] Electronic machine construction has become one of the leading sectors in the Bulgarian economy. The sector is comparatively young, but is already distinguished by unquestionable successes. A fundamental role in its development is played by the comprehensive program for socialist economic integration of the CEMA member nations.

At the present time, about 40 accords on specialization and cooperation are in force between Bulgarian and other socialist nations. Because of this, the NRB [Bulgarian People's Republic] is already producing large series of modern electronic equipment and exporting to many nations of the world, including the Soviet Union.

A "Technical Center for Electronics and Electrical Equipment" has been created at the NRB trade representative office in Moscow to service the supplied equipment and train Soviet specialists in the procedures for operating it. The center has lecture halls, a library of specialized literature, an exhibit of new equipment, rooms for individual exercises and a hall where various models of devices are demonstrated in operation. Under the supervision of the Bulgarian colleagues, one can here quickly learn how to work with the most complex peripherals of computer centers and master the ways of setting up all of these devices.

Lectures are given and practical exercises are conducted by Bulgarian engineers - the designers of the latest equipment and plant technologists, who produce these electronic machines and devices in their own enterprises.

If you were to leaf through the file with the remarks of Soviet specialists who have taken the training course in the "technical center", you could be surprised by the addresses of the enterprises which have sent them there to study: Minsk and L'vov, Yaroslavl' and Moscow, Tallin and Kalinin, Sverdlovsk and Gor'kiy, Alma-Ata and Novosibirsk. This list is extensive and shows the solid geographical scope of the use of the new equipment from our fraternal nation. It is pleasant to note that each person attending the lectures speaks

Figure 1. At a lecture on software.

Figure 2. The demonstration room of the "Technical Center for Electronics and Electronic Equipment."

in his account of the great usefulness of the lecture course, and the high level of refinement of the Bulgarian machines. The spirit of fraternal friendship which reigned in this training center was also noted.

"Please tell us how long ago the center was organized?", this question from the TEKHNIKA I NAUKA correspondent was put to the director of the "technical center", Bulgarian engineer Lyubomir Vitanov.

"First of all, I want to say that our institution is a young one, hardly more than a year old. But serious work has been done and it has given us considerable satisfaction. For good traditions have already been established with us. The most important thing is the fact that the training takes place in an atmosphere of sincere fraternal friendship."

"What types of electronic equipment are being used for training at the present time?"

"A course of lectures is planned at the center for the entire products list of devices delivered to the USSR, including magnetic disks, the "Estel" remote data processing systems, minitapes, data preparation units, and flexible disk stores. To be cited in particular are the YeS-5061 memories, included in the uniform system of computers of the CEMA. Bulgaria is specializing in the production of these devices and is supplying them to all socialist nations. The "Elka" series of electronic calculators have already been used in the Soviet Union for several years now. This family of computers is being continually supplemented and improved. We know their popularity in our country. Moreover, we will provide for early demonstrations of our new designs, which are just now being prepared for export deliveries, for example, the multiple control board data preparation systems, and disks with a large memory volume."

"Can you cite a figure for the number of students attending the courses annually?"

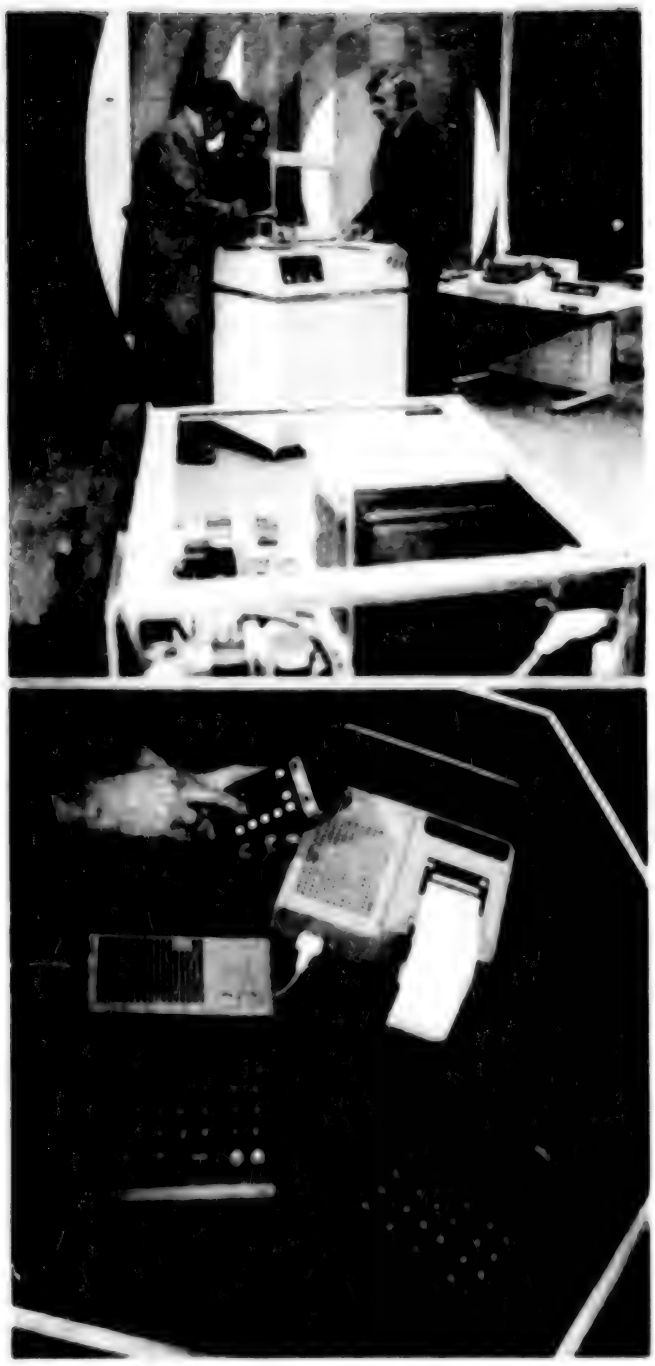
"Over the first year, more than 600 persons went through the training. But we are planning to increase the number of persons attending the lectures and hope to bring it up to 800 or even more. For the friendly ties of our nations are continually growing, and the export deliveries of various types of equipment are increasing. Yes, and even the electronic equipment itself is not standing still. We will always have a lot of work to do. And we will try to make it as fruitful a. possible."

From the editor. For the interested readers of TEKHNIKA I NAUKA, we will provide the address of the "Technical Center for Electronics and Electronic Equipment" at the NRB trade representative office: Moscow, Pyatnitskaya St., 67. We would remind you that registration for such courses is made through the sectoral ministries.

The Center Where Bulgarian Electronics is Studied

There is a small detached house with columns on Pyatnitskaya St., an old Moscow street in Zamoskvorech'ye. In terms of architectural style, it belongs to the end of the 18th century. But inside this building, the design is especially contemporary. The "Technical Center for Electronics and Electronic

Equipment", organized by the NRB trade representative office in the USSR, is housed in this building. In this center, Soviet specialists study the equipment supplied by fraternal Bulgaria to our nation, and learn how to work on the peripherals which are included in the unified system of electronic computers of the CEMA member nations. The work of the Bulgarian



center in Moscow is one of numerous examples of cooperation among CEMA nations, the basic result of which over 30 years consists in the fact that economic relationships based on principles of equality, mutual fraternal assistance, the unity of interests of each nation and the interests of cooperation as a whole, as well as on the principles of socialist internationalism have appeared and been confirmed in practice on an international scale. In just the

last 10 years alone, the industrial potential of the CEMA member states has doubled, while the mutual trade turnover has grown more than three times. Behind these figures is not simply a quantitative growth in production and trade, but qualitatively, a new level of interrelationship between our states, the final goal of which is the acceleration of scientific and engineering progress and putting the results of this pregress into practice (see the article, "Instruction in a Spirit of Friendship" [sic] on page 34).

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C. Bloc-NonBloc Cooperation

Translations of Articles

USSR

MIR-2 SOFTWARE SENT TO HELSINKI POLYTECHNICAL INSTITUTE

Kiev KIBERNETIKA in Russian No 6, Nov/Dec 78 p 143

[Article by SHCHERBOV, V. A.: "Transfer of Software for Analytical Methods to Finland"]

[Text] At the end of 1977, associates of the Special Design Bureau (SKB) of the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences delivered supplementary software for the MIR-2 computer to the Computer Center of Helsinki Polytechnical Institute. The software was designed to implement analytical methods of solving mathematical problems. It consists of 80 standard programs for the solution of problems in linear algebra, ordinary differential equations, differential equations with partial derivatives, etc.

The programs are written in the input language of the MIR-2 computer, ANALITIK, which was developed in the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences and its SKB under the direction of V. M. Glushkov.

The MIR-2 computer was purchased in 1974 by the Computer Center of Helsinki Polytechnical Institute and is being used to solve mathematical and engineering problems by analytical methods.

Finnish specialists are active participants in the SIGSAM organization, which unites the efforts of 32 of the world's countries on the development of these methods.

Members of SIGSAM believe that increasing the capacity of computational resources results in a steady expansion in the functions that can be carried out by computers, which primarily refers to the automation of symbolic transformations.

Such an expansion makes it possible to employ precise mathematical methods in the solution of scientific-technical problems when the solution can be found in a general form which is dependent on the parameters of the problems.

The set of information objects of the ANALITIK language is limited by the expressions of mathematical analysis. This has made it possible to devise a high-level apparatus for automatic recognition of the functional properties of such expressions, which in turn permits the creation of standard programs for the solution of a broad class of problems.

Our cooperation with our Finnish colleagues is mutually useful beyond a doubt, and its continuation will serve the further development of mathematical analysis methods.

D. Extractive Industries, Fishing

Abstracts of Articles

USSR UDC 553.048

CURRENT SITUATION AND PROSPECTS FOR USING COMPUTERS TO CALCULATE PETROLEUM AND GAS RESERVES

Moscow GEOLOGIYA NEFTI I GAZA in Russian No 5, 1979 pp 36-42 manuscript received 25 Sep 78

STASENKOV, V. V., KURDYUKOVA, G. B. (Ministry of the Petroleum Industry); SHURUBOR, YU. V. and MARKOV, N. N., PermNIPIneft' (Perm' Scientific-Research and Planning Institute of Petroleum)

[Abstract] One of the key developments in estimating reserves of minerals in the earth is switching to computerized methods. This requires software, hardware, and organization (data collection, etc.). With oil pools it is noteworthy that using the computer to establish the geometry of the pools permits 1): Better determination of the best places for exploratory wells; and 2): Elimination of the very time-consuming job of manual mapping. It also allows better monitoring of exploitation, and thus greater economies. The basic ideas of the field, known as mining geometry or geometry of the earth's interior, are 1): Practically any quantitative geological variable possesses the property of local simplicity, i.e., in the immediate vicinity of any concrete point a field can be described by low-order polynomials; and 2): The different variables must be reconciled with geological considerations, e.g., the gas-water contact is above the water-oil contact. The development of mining geometry with computers is exemplified by the work of the Perm' Petroleum Association, whose series of programs in 1972-1977 led to the comprehensive GEOL-1 program, which uses punched tape data on variables such as absolute elevations of the roof and floor of the producing layer and makes various maps and calculations. Problems are heavy machine use and poor adaptability for zones with different collecting capabilities, faulted structures, and indefinite outer boundaries. The new PMGP-1 program attempts to answer these problems. Parallel to this line of work is the development of procedures for interpreting geophysical data from field operations, in particular the Samotlor-Ts2 program package. Its only serious drawback is that considerable time is needed to tune it for a particular deposit. Figures 2.

E. Manufacturing and Processing Industries

Translations of Articles

COMPUTER RUNS THE PROCESS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Apr 79 p 2

[Article by Yu. Zhikharev, chief, computer department, Chemical Plant imeni 50 years of October, Comel': title as above]

[Text] It is necessary to say that even now not everyone believes in the possibility and effectiveness of using computers to control production processes and, in the old way, prefer traditional control and monitoring methods. Not at our plant, however. The sulfuric acid shop, which is "run" by a UM-1 control computer, operates above its planned capacity and frequently emerges the winner in competitions with shops belonging to the Ministry of the Chemical Industry. And, of course, it fills its customers' orders without interruption.

How did we succeed in doing this? In its initial form, the system--in accordance with the plan worked out by TsNIIKA [State All-Union Central Scientific Research Institute of Complex Automation]--was put to industrial use in the information mode and was basically used to calculate the shop's technical and economic indicators. The plant's collective set a goal for itself: to use the computer to control a process. This was a difficult and time-consuming task and an engineering risk, but the risk was justified since it relied on a knowledge of technology, experience and numerous calculations.

A lot of work had to be done. On the basis of a mathematical model of the process, we developed an algorithm and carried out the programming. The nonstandard equipment was built and the servicing personnel were trained. The roasting, absorption drying and contact divisions of the sulfuric acid shop were put under direct digital control of the computer. The goal was to obtain the maximum degree of contact, with accuracy and stability greater than when traditional local control systems are used.

The system was put into place in the shop and the production personnel became fully acquainted with it. The economic effect from its use has been 242,000 rubles per year. The introduction of the system made it possible to release 36 production workers. The system's operational reliability is 99.5 percent. In the final account, the use of the computer contributed to the awarding of the State Mark of Quality to our Grade A sulfuric acid.

Thus, our experience shows that a computer can successfully control a production process even under large-tonnage production conditions.

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USSR UDC 621.3:65.011.56.001.1

AUTOMATION: THE MOST IMPORTANT TREND TOWARD RAISING THE TECHNICAL LEVEL OF ELECTRICAL EQUIPMENT

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 79 pp 2-4

NIKITIN, YU. A., deputy minister of the electrical equipment industry; and SHEREMET'YEVSKIY, N. N., corresponding member of the USSR Academy of Sciences and scientific director on the problem "automation" in the electrical industry.

[Abstract] In order to meet the goals set forth at the 25th Congress of the CP USSR on increasing productivity and improving product quality, steps have been taken during the ninth and the tenth Five-Year Plan periods to introduce automated management systems (ASU) for electrical equipment and for technological processes as well as automated design and testing systems --all based on the latest achievements in microelectronics and digital techniques. A scientific-research center has been established for solving automation problems in electric power plants, in transformer substations, in electric heat treatment and welding plants, in railroad and urban transportation systems, and in machine shops or other enterprises using electric drives. Automation requires a psychological as well as technical reorientation of the entire personnel, from management down to mechanics and electricians. In preparation for it, the scientific teams are active in three areas: 1) Application of microcircuits with various degrees of integration and with "stiff" logic in any new automated electrical-equipment management system; 2) Introduction of microprocessors and microcomputers already produced by enterprises under the Ministry of the Electrical Equipment Industry (Elektronika-60 and several variants of Elektronika-S5); and 3) Development of special-purpose problem-oriented control microcomputers. The problem "automation" is being solved in several stages. First comes replacement of electromechanical and discrete electronic components with integrated-circuit devices, involving all necessary scientific-research and experimental-design activity. Second comes development of hybrid, special-purpose and data display systems. For the eleventh Five-Year Plan period a large-scale

transition to digital control and local automatic computer complexes is foreseen. The correctness of this overall approach has been confirmed at the "Elektro-77" exhibition in Moscow summer 1977 and at the International Electrotechnical Congress. An economic effect is achieved not only by more efficient operation of electrical equipment and by labor saving but also by the lower cost of the control equipment. A typical example is the metals industry, where automatic operation of electrical equipment such as electroslag remelting furnaces or galvanizing troughs should save millions of rubles annually. At the same time, an automated design system and an automated testing-inspection system are made ready for installation at the high-power laboratory of the All-Union Electrotechnical Institute imeni V. I. Lenin in 1980. An automated design of a new series of induction motors has already been made feasible.

USSR UDC 621.365:681.142.001.4

INFORMATION-MEASUREMENT CHANNEL OF A MICROCOMPUTER-BASED CONTROL SYSTEM FOR AN ELECTROSLAG REMELTING FURNACE

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 79 pp 15-16 manuscript received 27 Oct 78

TOLKACHEV, G. B. [deceased], NOVIK, G. KH., IZAKSON-DEMIDOV, YU. A., candidates in technical sciences, and KUTSKAOV, S. YA., engineer

[Abstract] Modern industrial control systems have an information-measurement channel which includes instrument transducers for generating standard voltage or current signals and analog-to-digital converters for encoding them. The correct design of such a channel with properly selected components has been checked over a period of 3 months in an OKB-1111 electroslag remelting furnace. The instrument transducers Ye825/1 (0-125 V) and Ye824 (0-5 A) in the accuracy class 0.5 as well as Ye748/2 (0-5 A or 100 V) in the accuracy class 0.25 are manufactured at the Vitebsk Electrical Instruments Plant. The encoder, manufactured by the Leningrad "Svetlana" Association, is a multichannel device operating in the integration mode for high noise immunity and in conjunction with a microcomputer. A highly noise-immune transmission of information signals is achieved in large measure by proper layout and protection of all connecting cables. No cable crossings occur, all wire pairs are twisted and shielded by steel tubes. The channel is found to operate satisfactorily under real conditions in the presence of external magnetic fields and despite instability of the line voltage with resulting flicker. Figures 1; tables 1.

USSR

LABOR STANDARDS STORED IN THE MAGNETIC MEMORY OF A COMPUTER

Moscow EKONOMICHESKAYA GAZETA in Russian No 22, May 79 p 17

BOGDANOV, V., chief, Department of Labor and Wage-Rates; and YAKUBOVICH, S., chief, Information and Management Center of the Industrial Association "Plant imeni Maslennikov," Kuybyshev

[Abstract] An automated management system has been installed by the Association which can solve at least 240 different problems and serves all production segments. It differs essentially from those systems installed in other enterprises in that it performs the management task on many levels. Labor, for instance, is managed here from the Association level down to the squad level. Its two major functions are operational planning of the production volume and operational tracking of the economic activity in each shop as well as in the Association as a whole. The information and computation center receives all pertinent data on a daily basis so that all deviations from previous estimates can be promptly detected and analyzed for use in making further projections. One of the subsystems of the automated management complex is "labor and wages," with all existing standards relative to each plant operation and covering a few hundred thousand items coded and stored in the computer memory. Daily acquisition of operational data on yesterday's Association-wide activity has already made it possible to double the daily output of socialistically competing production collectives and individual shops. The results are communicated through the channels to each subdivision of the Association, revealing any weak points and enabling the managers to address the personnel on necessary improvements.

USSR

COMPUTER CENTERS BEING ESTABLISHED IN YEREVAN ELECTRICAL ENGINEERING INDUSTRY

Moscow IZVESTIYA in Russian ("The Computer Helps") 8 Jul 79 p 1

[Abstract] Yerevan. All of the enterprises belonging to the city's electrical engineering industry will soon be equipped with electronic computers. Computer centers are already in operation in the "Armelektromash" and "Armelektroapparat" Associations, and a computer center was recently opened at the "Armelektrosvet" Association. The latter is using its computers to help design electrical engineering equipment.

CSO: 1863-P

F. Power System

Translations of Articles

USSR

AUTOMATED MANAGEMENT OF POWER SYSTEM IN BASHKIR ASSR

Moscow IZVESTIYA in Russian 4 Jul 79 p 1

[Article by KONDRAT'YEV, A., Ufa: "The Computer Monitors"]

[Text] The first phase of an automated management system (ASU) has been put into operation at the Bashkirenergo Association in Bashkiriya. The computer will calculate the generation and expenditure of electrical energy and will monitor the status of equipment and of the power transmission lines. Preliminary calculations indicate tha. the ASU will save no less than half a mi'lion rubles per year.

CSO: 1863-P

C. Transportation System

Translations of Articles

COMPUTER PLANS AIRCRAFT TAKEOFF

Moscow VOZDUSHNYY TRANSPORT in Russian 14 Apr 79 p 2

[Article by Yu. Bubennov, chief of the Central Scientific-Research Institute of Automated Management Systems for Civil Aviation]

[Text] Scientific developments completed at the Central Scientific-Research Institute of Automated Management Systems for Civil Aviation (TsNII ASU GA) serve as the basis for several still to be designed or already installed automated systems which will ensure more efficient processes of planning and management in aviation enterprises, in aircraft maintenance plants, and in territory-wide and sector-wide administration of civil aviation.

For instance, systems developed at the Institute produce two documents most important to the air-transportation sector: an aircraft traffic plan and a central schedule of aircraft traffic. The economic effect of operation based on these two items alone is an annual saving of over 6 million rubles.

Specialists at the Institute have developed scientific, methodological and legal concepts pertaining to automated management in the air-transportation sector. This ideology permeates all aspects of sector management, from long-term planning to operations control, from automation of processes involved in producing long-range, short-range and operational plans for sector activities to operational control of technological processes on the aviation enterprise level.

Such an approach to problems in automated management of sector activities has resulted over the past few years in several design solutions for territory-wide management of aviation enterprises and aircraft maintenance plants. In 1978 alone the computer capacity for civil aviation use increased by over 30 percent. Approximately 15 new third-generation computers were put in operation. In performing their tasks, these computers have over the past three years yielded a total annual saving of approximately 23 million rubles.

The problem of converting Aeroflot to a standard transportation system is intensively studied by the Institute's staff, which includes nationally known scientists and specialists on automated management systems. New frontiers for automation are being drawn which correspond to the most modern requirements in the field of scientific-technical progress.

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CSO: 1863

USSR

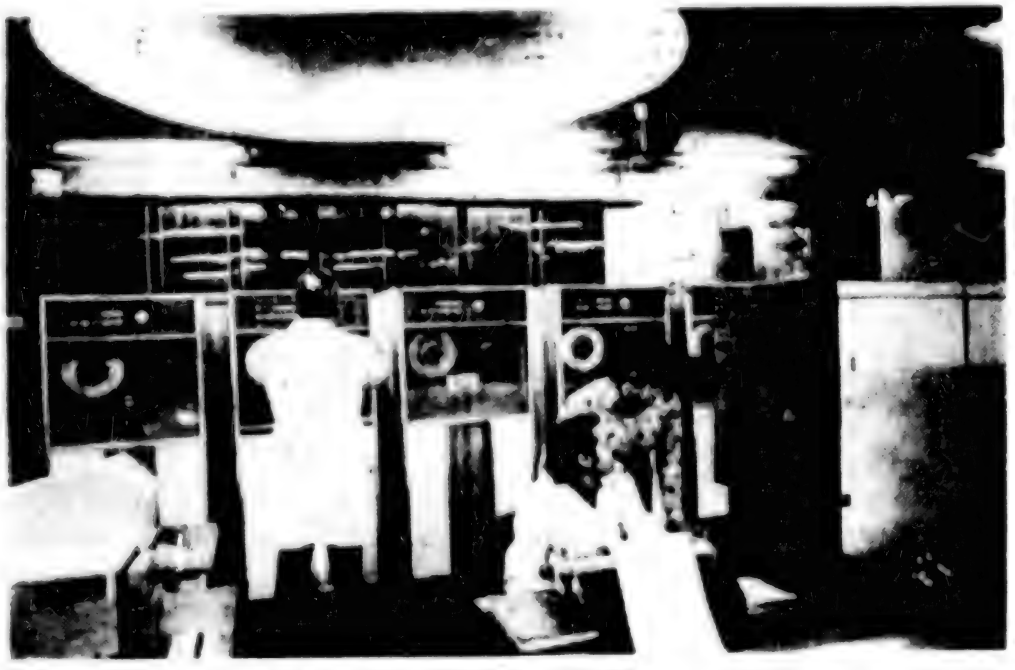
M-4030 COMPUTER AT CIVIL AVIATION MAIN COMPUTER CENTER

Moscow VOZDUSHNYY TRANSPORT ib Russian 24 May 79 p 2

[Photo and caption]

[Excerpt] An M-4030 computer has been operating almost three years at the Civil Aviation Main Computer Center. It aids in the solution of complex problems and in the development of automated systems for management of civil aviation production. Today eleven subsystems are in use.

Many aviation enterprise computer centers are equipped with such computers.



CIVIL AVIATION NEEDS COMPUTER SPECIALISTS

Moscow VOZDUSHNYY TRANSPORT in Russian 26 May 79 p 3

[Article by Zh. Chernenko, rector of the Riga Red Banner Institute of Civil Aviation Engineers imeni Leninist Komsomol, Professor and Doctor in Technical Sciences]

[Excerpt] In recent times the use of computers has been taught in educational institutions. Consequently, graduates have stronger knowledge in that area. But when they arrive at work they seem to go on a wild goose chase. The possibilities of computers are far from completely used in airports. The extensive information now concentrated in multiple-user information-computer centers is not properly used. Here is a simple example: the decipherment of flight information gives abundant material not only about flying technique but also about the state of aviation equipment and even about the level of execution of certain operations prescribed by regulations. Unfortunately, in most cases that information remains on the recorder tapes.

Still stranger is the example of the Kazakhskoye Civil Aviation Administration, where a group of creatively thinking engineers extracts from decipherment of flight information considerably more than in written in the instructions. As a result a clear picture of the crew's actions is presented and a thorough analysis of the state of the aviation equipment can be made. Such an approach to the matter is especially important if it is taken into consideration that at the present time aircraft equipped with improved recorders are starting to go into operation.

Flight information decipherment groups and sectors have already existed in our sector for a fairly long time. Evidently a need has developed to generalize their experience and think about wider use of computers to process decipherment date. Obviously it is necessary to work out corresponding forms of documents with the needs of users taken into account. Our institute, jointly with the State Scientific-Research Institute of Civil Aviation, the Central Scientific-Research Institute of Automated Management Systems and the State Scientific-Research Institute of Operation and Maintenance of Aviation Equipment, has already begun this work.

Unfortunately, some engineers and leading workers do not know the real possibilities of computers. True, in recent years much has been done in the training of specialists in that direction. In our opinion, however, the time has arrived to proceed toward thorough study and the instruction of corresponding workers in programming, even if it is in simple languages of the type of FORTRAN.

Today our institute is observing its 60th anniversary. The oldest educational institution of the sector, it is credited for large contributions to civil aviation. But that is in the past. And Aeroflot's future will require of us improved and higher quality of the training of specialists.

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CSO: 1863

NEW AIR TRAFFIC CONTROL SYSTEM DESCRIBED

Moscow VOZDUSHNYY TRANSPORT in Russian 16 Jun 79 p 2

[Article by A. Sdvishkov, special correspondent of VOZDUSHNYY TRANSPORT from Mineral'nnye Vody: "Electronics Gives Advice to the Traffic Controller"]

[Text] An automated air traffic control system has been put into operation at the Mineral'nnye Vody Airport.

The airport was operating at its customary intense pace, as it is presently the peak season at the Northern Caucasus resorts, and many vacationers prefer to use airplanes. Passengers were flying in and departing, and none of them guessed that an event was occurring for the collective of the aviation enterprise, and this was a very significant one. For the first time in aeroflot, the Berkas automatic air traffic control system was being put into use here.

On the eve of putting the system into operation, I spoke with the senior engineer of the control center of the automated system, B. Biketov.

"We have long been waiting for this day," said Boris Dmitriyevich [Biketov], "because the introduction of this system will provide us with many advantages. In the first place the traffic controller remains the chief figure, but he is given enormous aid by electronics which assumes the bulk of all sorts of operations which prior to this have been performed by man. The new system increases the intensive use of the air space (its traffic capacity), as well as flight safety and regularity. The greater intensity is achieved by reducing the time the airplanes are in the airport air zone, and this also helps to save fuel and reduce flight time. This system will greatly facilitate the work of the traffic controllers."

B. Biketov acquainted me with the running of the automated system with the electronic computers, the so-called extension and peripheral equipment and communications. In order to house all of this, a large three-story building and a one-story building were constructed and underground communications laid.

And here was the "heart" of the system, the air traffic controller room. There was a bright indicator: "High Cleanliness Zone." And here the cleanliness was truly ideal with air conditioning and each person entering put on white lab coats and overshoes. The light was soft and pleasant on the eye, there was no noise and the conversations were scarcely audible. The traffic controllers were seated in comfortable chairs, and instead of the customary microphones there were headsets. In a word, all the conditions to minimize the fatigue of the personnel and to increase their working efficiency.

The control panels differed greatly from the ordinary ones, as each person was supplied with an air situation plan position indicator and two rectangular digital displays, multiple keyboards and a stripboard...the strip was a tape on which the computer printed out information on the route of the aircraft, its call numbers, the time of flying over the control points, and so forth. Because of this the controller had no need to keep log entries or graphs. And on the rectangular displays was diverse computer-generated information including the departure airport of one or another aircraft, the aircraft number, the time of departure, the set altitude of flight, and the estimated landing time.... On the electronic diagrammatic map of the air situation indicator one could clearly see the corridors, the holding zones and areas which were dangerous from the standpoint of weather conditions. When necessary, an individual sector by the turning of a knob could be brought closer and isolated in order to better understand the situation. The air zone in front of the controller was as real as the palm of his hand. Incidentally electronics monitors his actions. All of this substantially increases the reliability of control and flight safety.

The control panels also differ from the conventional ones in terms of the placement of the work areas.

The first to "break in" the system were M. Yeliseyev, Ye. Shcherbanev, P. Pogrebinskiy, Yu. Zhuravlev, S. Propkopets, S. Yermolayeva and Ye. Matsukatova. Their work was carefully observed by the senior instructor traffic controller A. Mozhdzher, the instructor controllers M. Lybinov and V. Chernyy, and the chief of the airfield traffic control center V. Dundukov who had been involved in building the automated system.

The evening hours were chosen for putting the system into use because at this time the skies over Mineral'nnye Vody were rather "empty." And this was done not all at once, but rather gradually, and for a certain time there was "dual power" in the airport traffic service. One shift of controllers operated on the existing system, while the other entered the situation using the automated one, in following the situation but still not intervening.

This, of course, was preceded by great work. The traffic controllers were retrained and underwent training sessions. For this reason at "zero hour" they felt calm and confident. But still the veteran Mikhail Vasil'yevich Yeliseyev not without excitement said for the first time: "Taking over!"

I looked at my watch. Some 50 minutes had passed since the traffic controllers had come on duty. An incomplete hour in which was focused long months of work by many people.

10272
CSO: 1823

AUTOMATIC AIR CONTROL SYSTEM

Moscow PRAVDA in Russian 27 Jun 79 p 6

[Article by "Pravda" Correspondent, V. Pankratov (Mineral'nyye Vody): "Electronics Will Not Let Us Down"]

[Excerpt] "Our airport is one of the largest in the country," stated I. Ustyugov, commander of the Mineral'nyye Vody Consolidated Aviation Detachment." Computers are used to implement various operations. For example, they aid in landing planes when visibility is limited. The time is not too far distant when this will be done when visibility is zero, say, in fog..."

Accompanied by the chief of operations of the radio equipment and communications facilities of the aviation detachment, I. Karasov, we go to a building located beside the terminal. The automated system for management of airborne traffic is located here.

The first report on the readiness of the new system was given by the Senior Dispatcher of the western sector of plane approaches, M. Yeliseyev. Then, one after the other, reports were given by dispatchers of the other three sectors: west, south and north. The first plane appears as a yellow dot on the round screen of the indicator. This was a TU-154 coming from Mo[illegible]v. M. Yeliseyev talks to the pilot over the communications channels.

"You are now at a height of 4500 meters." "Precisely. How did you know? In this dialogue, perhaps, is hidden the sense of the innovation. Previously, data on the height of the plane, its speed, fuel reserves and other information were obtained by the traffic controller from the pilot. They talked back and forth many times and the airwaves were overloaded. Now, the necessary data is given by computers and by displays installed on the planes. Electronics will not fail.

2291
CSO: 1863

THE USE OF COMPUTERS ON RAILROADS

Moscow GUDOK in Russian 27 Jun 79 p 4

[Article by N. Kovsha, chief of the RR division (Vitebsk): "Sources of Data"]

> [Excerpt] The automatic gathering and computer processing of data on freight, cars, trains, locomotives etc. is an important condition for improving the entire technology of the transport conveyor. If the automatic collection of data in the very first stage of its origination is strengthened, i.e., when the freight is loaded into the car, the work would be simplified at all the following stages. This is the opinion of the author of the article published today.

[Excerpt] Cooperation between workers of the Belorussian Computer Center, the RR administration and our division has led to the development and introduction of the technology of providing computers with initial data from the stubs of the bills of lading about each completed loading operation. A system of codes has been developed and the following data are transmitted to the computer center: the number of the loaded car, the weight and name of the freight, shipper requisities, destination, consignee, and the number of the unloaded cars and the unloading station.

This data from all loading points of the division is received at the computer center as loading operations are being implemented. By 19:00 hours, the computer center has all the data for the preparation of the daily reports.

The Vitebsk Division is of average size. The average daily loading is about 1500 cars and unloading--600 cars. The initial and final operations are at 48 stations and adjoining access sidings. But far from all station communicate with the computer center.

The primary data at the division is collected at seven points of data concentration (PKI). Vitebsk, Polotsk, Novopolotsk and Chepino stations have their own PKI. Vit'ba transmits data about its own freight work, as well as about the operation of the Pridvinskaya Station. The PKI at Krulevshchizna services 18 intermediate stations of adjoining sections. The seventh PKI is organized directly at the division. It collects and transmits data from 24 stations to the computer center.

So far, there are certain complications in this matter due to special features of the division (dispersion of stations, overloading of telephone lines, great lengths of sections). We are trying to eliminate these "bottlenecks." In recent years, workers of the signaling and communications service,

and the communications workers of the division itself have strengthened the equipment base considerably and developed a data communications network. If this work were organized more solidly, it would be possible to separate a special selector communications channel between stations, loading points and PKI. In my opinion such expenditures would pay for themselves rapidly.

Before the creation of the PKI, data about loading work were received by the division once a day, 3 to 4 hours after the expiration of the report day. Now the computer sends it to us for each station and for the division as a whole twice: at 7:30--about night work, and at 20:30--about the daily work according to all report forms.

At another large freight station, Novopolotsk which ships over 1000 cars of petroleum products a day, two "Zoyemtron" units are installed. In the automatic mode they print transporting documents and at the same time issue a punched tape for direct transmission of data to the computer center on the loading operation done, i.e., practically simultaneously with the preparation of the primary freight document, the computer center receives the necessary data.

What is the authenticity percentage? At first, speaking frankly, individual improper results occurred. Frequently there were considerable spreads between the data of the computer center and the manually processed data (for a time, we were forced to duplicate the gathering of the data). But this is behind us now. Moreover, periodically conducted tests shown that the automatic systems make fewer mistakes than man.

Special seminars were held even before changing over to this new accounting system. Data service workers were trained to fill out shipping documents correctly. A schedule was prepared for collecting and transmitting data, the most responsible freight work sections and PKI were provided with skilled specialists.

Recently a brigade from the main administration of the Ministry of RRs visited our division. It acquainted itself with the existing system and was interested in the long-range prospects. Judging by the fact that a decision was made to use the system we adopted as a reference system and to finish it up to perfection, it may be assumed that the representatives of the ministry liked many things. Now it is our turn to wait for help; equipment is needed (we requested 2-3 "Iskra-554" units, for example, from all departments including the ministry but without results). It is necessary to increase somewhat the data service staff even if we have to use local revenues.

2291
CSO: 1863

H. Communication System

Translations of Articles

ELECTRONICS DECODES TELEGRAMS

Moscow VOZDUSHNYY TRANSPORT in Russian 13 Mar 79 p 3

[Article by T. Nikitina, Vozhdushnyy Transport's Own correspondent, Leningrad: title as above]

[Text] I will begin with a number: 20 million. That is the number of telegrams that pass through Pultovo Airport's main telegraph center every year. Each one leaves a clear track on punched tape, which track is information that is intelligible to telegraphers. The messages contain information on weather forecasts at landing points and along routes, aircraft takeoffs and urgent cargos; in a word, the most diversified types of information needed by aviators.

If the teletype tape handled by the main telegraph center every year were to be stretched out in a line, it would extend for 12,000 kilometers. This comparison, of course, is not completely scientific, but it demonstrates quite graphically the magnitude of the Leningrad telegraphers' workload. Thus, there is a good reason why it was previously done by more than 100 people.

Their difficult and tiresome task is now being done by a machine. The first Soviet-made communications switching center (TsKS) began operating at Pultova Airport.

"The TsKS was developed on the basis of Soviet-made electronic control machinery," says L. Spasenova, senior expert in the Communications Division, Communications Electronics Equipment Administration, Ministry of Civil Aviation. "This automated system solves the problems involved in receiving, storing, processing, and routing messages and then transmitting them over outgoing channels. In addition to this, the system makes it possible to monitor the correctness of the incoming and outgoing numbering of the messages."

This unique device is located in a spacious, well-lighted area where the temperature is kept constant. Lights of different colors--red, yellow, green--flash on the computer's panels and control points. This is the brain of the TsKS: the Elektronika NTs-1 minicomputer.

Here we see neither the customary streamers of telegraph tape nor telegraphers hunched over the equipment. From numerous communication links, information enters the telegraph adapter units. These devices formulate electrical impulses in such a manner that they become intelligible to the machine. The computer examines the telegrams, sorts them according to urgency, and searches for communication links, giving a "green light" to the more urgent messages.

The Elektronika NTs-1 equipment provides maximum utilization of the communication links, high efficiency, clarity, and reliability. Delays pending transmission, which were unavoidable when manual labor was involved, have been eliminated, and the message-processing time has been reduced to a fraction of its former length.

However, while providing high accuracy and work quality, the computer requires the same of the people dealing with it. A telegrapher who sends a message to the computer must adhere strictly to a whole series of requirements: indicate the address of the recipient accurately, not allow the number of symbols in the text to exceed what is allowed.

"Well, what if there is a mistake anyway? How does the machine act in this case?"

"When the mistake is not too serious," continues L. Spasenova, "'Elektronika' corrects it on its own. However, if the machine 'has doubts' or 'finds itself in difficulty,' it immediately signals this to the duty operator."

Bright green letters and numbers suddenly light up on the display screen--this is the complete text of a telegram. A special symbol indicates the error. "Playing" on the display's keys, operator N. Andreyeva quickly corrects the mistake. This is how man and machine work together.

Only 20 people are needed to run the automatic communications switching center. All of them--TsKS Chief V. Gaydamaka, senior engineers G. Krasnov and Ya. Etsin, senior engineer-programmer V. Zav'yalov, operators N. Andreyeva and Ye. Pakhomova, and other workers of the Center--have higher and secondary special educational training and have passed the training required to work with the computer.

The excellent skills of the people and their experience and knowledge, in combination with the broad capabilities of the equipment, produce excellent results and provide high quality and efficient labor with high productivity indicators.

11746
CSO: 1863

I. Construction

Translations of Articles

PREPARATIONS FOR ASUS

Baku VYSHKA in Russian 5 Jul 79 p 2

[Article by A. Abdurakhmanov, head of the division for the development and introduction of automated construction management systems (ASUS), of the Planning, Design and Technological Office (PKTB) of Glavbakstroy, and L. Epshteyn, chief project designer]

[Text] Each morning the chief of Glavbakstroy starts with his examination of a summary for the preceding day which contains data on the delivery of prefabricated reinforced concrete and millwork, the yield of manpower, the presence of construction equipment... The chief attentively studies the indicators of fulfillment of the plan for total volumes of construction and installation work. Yesterday the computer issued an unfavorable forecast on one of the construction administrations--at its present rates it will not cope with the monthly task. Calling the chief dispatcher on the selector, he gives him the task of preparing for today's meeting information on all the objects of the "unfavorable" administration.

From the dispatcher point a request is directed to the computer center of the Main Administration (Glavk) by means of "Shtrikh" facsimile apparatus connected to an ordinary telephone. After some time the "Shtrikh" began operating again. Complete information about the course of construction of planned objects, obtained from the computer storage, lies on the table and will be discussed in detail at the conference...

But not only the lagging construction administration disturbed the Glavk managers on that day. Before them lay two computer-calculated variants of the plan for the following year. The first, the optimal variant, permitted uniformly loading production capacities during the year, but in that case the assigned input rates were not maintained on all objects. According to the second variant all the deadlines were met but in the middle of the third

quarter a "peak" of requirements for trim developed. Which was to be selected? It was necessary to think it over, to take counsel. The computer had warned in time about a critical situation that could arise later in the year...

None of the pictures sketched by us have been brought to life yet. The collective of the Planning, Design and Technological Office (PKTB) of the Main Administration is working to make them a reality and the electronic computer has actively participated in the management of such complex production as construction.

We started the planning and creation of the "ASU--Glavbakstroy" with investigation of the system that had already formed. We analyzed the functions of management and document circulation on different levels: Glavks, trusts, plants, construction administrations and motor-vehicle bases. Several circumstances helped to do labor-intensive work with relatively small forces. All our administrations and enterprises can be broken down into several groups, in each of which the organization of production has an approximately similar structure. This permitted extending the results of analysis of one collective's activity to all the others in the same group. In addition, the results of a number of previous developments completed by specialists of the Planning, Design and Technological Office were used.

We also studied experience available in this country on the introduction of ASU in construction. It suggested that the introduction of separate tasks into an ASU still does not give a considerable effect. Therefore in the development of a technological task, and later of its plan, a complete systems approach is used in order to embrace all aspects of the production and economic activity of our builders. Now we have something in ready form: a technological plan of a computing and data processing center has been prepared for a number of first-priority automated construction management system (ASUS) tasks.

Creative collaboration of the Chelyabinsk Planning and Design Office for ASU and the Department of Organization and Management of Construction of the Leningrad Institute for Improvement of Qualifications in Methods and Technology of Control, the study of a large number of developments of ASU for construction organizations and the wide use of standard planning solutions and packages of practical programs have permitted working on a fairly high technological level, as is indicated by reports obtained from the Institute of Cybernetics of the Academy of Sciences of the republic, and other organizations.

In the current Five-Year Plan provisions are made for the introduction of two subsystems of the first line of the "ASU--Glavbakstroy," mainly including tasks in the management of construction production, including tasks in the planning of construction and installation work, determination of the